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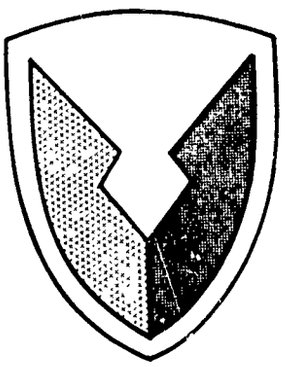

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VIBRATION AND ELEVATOR LOADS SURVEY TESTS OF THE UH-1M HELICOPTER WITH THE FORWARD-LOOKING INFRARED (FLIR) SYSTEM INSTALLED

FINAL REPORT

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PROJECT PILOT

JUNE 1971

US ARMY AVIATION SYSTEMS TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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The UH-1M/FLIR helicopter vibration and elevator loads tests were conducted at Fort Rucker, Alabama, from 17 through 26 September 1970. Main rotor vibration characteristics and elevator loads were determined both with and without the FLIR system installed. Nine parameters of vibration and six channels of elevator loads were evaluated to determine military specification compliance, and to provide mission suitability information for inclusion in technical manuals and other publications. The elevator loads and vibration characteristics were generally unaltered by the installation of the FLIR system, except for the vertical vibration magnitudes at a frequency of 4/rev. The magnitude of the 1/rev vertical vibration was irritating to the flight crew and exceeded the limit as specified in the military specification, MIL-H-8501A, when operating at or near the forward cg limit at low airspeed (less than 65 knots calibrated airspeed). The 4/rev vertical vibration levels exceeded the specification limit and were generally greater with the FLIR system installed. The amplitude of the 8/rev vertical vibration was higher than the limit specified in paragraph 3.7.1(b) of MIL-H-8501A during diving flight. Analysis of the elevator beam bending loads data without the FLIR system installed indicated that there was some increase when compared to contractor test results of the standard UH-1C/M21 helicopter.

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INTRODUCTION

BACKGROUND

1. The UH-1M helicopter, a modified UH-1C, is currently in use as an aerial platform for various night vision systems. The Night Vision Laboratory, Fort Belvoir, Virginia, has a requirement to develop an airborne forward-looking infrared (FLIR) system for installation on various Army helicopters. The system installed on the UH-1M for this evaluation was developed by Hughes Tool Company. During the service test of this system by the US Army Aviation Test Board, Fort Rucker, Alabama, an excessive low frequency vibration was detected which resulted in the interruption of these tests. The Night Vision Laboratory Project Manager requested that the US Army Aviation Systems Command (USAAVSCOM) conduct a quantitative survey to determine the nature of the vibration. The US Army Aviation Systems Test Activity (USAASTA) was directed by USAAVSCOM to conduct tests (ref 1, app I).

TEST OBJECTIVES

2. The objectives of this test were as follows:

a. To determine the vibration characteristics of the UH-1M/FLIR helicopter.

b. To determine the changes in aircraft vibration characteristics attributed to the FLIR system installation.

c. To determine the magnitude of the loads acting on the right and left elevators with the FLIR system both installed and removed.

DESCRIPTION

3. The test helicopter was a modified UH-1C helicopter which incorporated a single, two-bladed, semirigid, "door-hinge" type main rotor system. The UH-1C helicopter was modified to accept a T53-L-13 free turbine engine and was redesignated the UH-1M. The empty weight of the helicopter was increased 34 pounds by the installation of the T53-L-13 engine. Maximum power rating of the T53-L-13 engine is 1400 shaft horsepower (shp) (uninstalled) for standard-day, sea-level (SL) conditions. However, this engine is derated to 1100 shp when installed in the UH-1M because of the maximum torque limit of the main transmission. The test aircraft was further modified to accomodate the FLIR system which, when installed, adds approximately 706 pounds (excluding armament) to the empty weight of the UH-1M. A more detailed description of the UH-1M helicopter is contained in the UH-1M operator's manual (ref 2, app I). The FLIR system is a night vision system that enables the UH-1M crew to locate and strike

targets in near darkness or limited-visibility conditions. A direct viewing element, using an infrared sensor, transmits an image to three cathode ray monitoring screens installed in the cockpit and aft cabin areas. A more detailed description, including the weights of individual components, is presented in reference 3, appendix I.

SCOPE OF TEST

4. The UH-1M/FLIR helicopter was evaluated to determine the magnitude and nature of vibration at main rotor harmonics both with and without the FLIR system installed. The criterion used to determine acceptable vibration characteristics was paragraph 3.7.1(b) of military specification MIL-H-8501A (ref 4, app I). Elevator loads data were also recorded to determine the change in loads, if any, with the FLIR system installed. Eight flights were flown for a total of 10.8 hours, of which 8.2 hours were productive. The test program was conducted at Fort Rucker, Alabama, from 17 through 26 September 1970. The test aircraft was maintained and supported by US Army Aviation Test Board personnel during the test program. The flight restrictions and operating limitations contained in the operator's manual (ref 2) were observed during the tests, except that hovering in winds was limited to 15 knots (ref 5).

5. The empty weight of the test aircraft with the FLIR system and M21 armament system installed (less ammunition) was 6957 pounds with the longitudinal center of gravity (cg) at fuselage station (FS) 131.34. Removal of the turret portion of the FLIR system resulted in an empty weight of 6629 pounds with the cg at FS 135.91. These empty weights included the test instrumentation which weighed 145 pounds with a moment arm of 78.0 inches.

METHODS OF TEST

6. Vibration data were gathered during various flight conditions both with the FLIR system installed and removed. Data reduction procedures used in these tests are established engineering test techniques and are described briefly in appendix II. Nine vibration sensors were used to measure amplitude in terms of acceleration (g). Instrumented elevators, to measure flight loads, were calibrated and provided by Bell Helicopter Company for installation on the test aircraft. The vibration and elevator loads data were recorded on a 50-channel oscillograph. A detailed listing of the test instrumentation is included as appendix III. Trim condition data (airspeed, altitude, fuel weight, etc.) were recorded from noncalibrated production cockpit instruments. The test gross weights and cg locations used for this evaluation are representative of the helicopter's mission load condition with the FLIR system installed.

CHRONOLOGY

7. The chronology of the test program is as follows:

Test directive received (verbal)	9	September	1970
Test aircraft released for testing	17	September	1970
Safety-of-flight release received	21	September	1970
Flight test initiated	22	September	1970
Flight test completed	26	September	1970
Letter report submitted	27	November	1970
Advance copy of report submitted	25	May	1971

RESULTS AND DISCUSSION

GENERAL

8. Engineering flight tests were conducted to evaluate vibration characteristics and elevator loads both with and without the FLIR system installed. The vibration characteristics were unaltered by installation of the FLIR system for all harmonics of the main rotor, except the 4/rev vertical vibration. For the conditions tested, the magnitude of the 1/rev vertical vibration was irritating to the flight crew and exceeded the limit specified in MIL-H-8501A (ref 4, app I) when operating at or near the forward cg limit at a low airspeed (less than 65 knots calibrated airspeed (KCAS) level flight condition. The 1/rev vertical vibration characteristics were not affected by the installation of the FLIR system which caused the longitudinal cg to shift forward. The 4/rev vertical vibration levels exceed the MIL-H-8501A vibration limit from 36 KCAS to maximum airspeed for level flight (V_H) at gross weights ranging from 8100 to 9300 pounds, and the peak values measured were generally greater with the FLIR system installed. The magnitude of the 8/rev vertical vibration was higher than the limits specified in paragraph 3.7.1(b) of MIL-H-8501A during diving flight. The installation of the FLIR system had a negligible effect on the elevator loads when compared to similar data with the FLIR system removed. Analysis of the elevator beam bending loads data without the FLIR system installed indicated some increase when compared to contractor test results of the standard UH-1C/M21 helicopter.

AIRCRAFT MAIN ROTOR TRACKING

9. A complete maintenance overhaul had just been performed on the test aircraft at Atlanta Army Depot, Forest Park, Georgia. All main rotor dynamic components (rotor blades, mast, stabilizer bar, and hub assembly) had less than 36 hours of flight time. Tracking of main rotor blades was performed prior to the start of the test program and found to be within tolerance. The test aircraft was representative of a well-maintained UH-1M aircraft, and the test results do not reflect the maximum allowable maintenance tolerance levels for dynamic components and fuselage rigidity.

AIRSPEED CALIBRATION

10. An airspeed calibration was not conducted on the test aircraft since adequate standard airspeed system position error information is presented in references 3 and 6, appendix I. Zero instrument error was assumed. The airspeed position error presented in reference 6 was used to determine calibrated airspeed with the FLIR sensor (chin turret) installed, and airspeed position error presented in reference 2 was used when the FLIR system sensor was removed.

VIBRATION CHARACTERISTICS

11. The objective of these tests was to define the vibration characteristics of the UH-1M aircraft both with and without the FLIR sensor installed. Vibration data were recorded in four locations in various axes with nine vibration accelerometers. The exact location and axes recorded are listed in appendix III. Main rotor vibration harmonics evaluated were the 1/rev, 2/rev, 4/rev, 6/rev, 8/rev, and 10/rev. When the FLIR system was removed, it was impossible to load the aircraft so that the same mass distribution was encountered as when the FLIR system was installed. The inability to obtain the same mass distribution could be a contributing factor to the differences in vibration characteristics when comparing data for these configurations. A list of the conditions tested is presented in table 1, and graphic results of the vibration test are presented in figures 1 through 63, appendix IV.

Vertical Axis

General:

12. It was determined, by comparing data acquired under similar test conditions both with and without the FLIR system installed, that the installation of the FLIR system had a negligible influence on the vertical (up and down) vibrational levels at all main rotor harmonics, except for the 4/rev. Peak values of the vertical 4/rev vibration levels were generally greater with the FLIR system installed, and the data indicated that occurrence of the peak vibration levels was independent of airspeed with the FLIR system installed or removed.

1/Rev:

13. The magnitude of the 1/rev vibration was irritating to the flight crew when operating at or near the forward cg limit in a stabilized level flight condition at low airspeeds ranging from 40 to 65 KCAS. Peak 1/rev vertical vibration values of 0.163g (fig. 10, app IV) and 0.175g (fig. 1) were realized at a trim airspeed of 58 KCAS, with the FLIR system installed, at gross weights of 8510 and 9060 pounds, respectively. The longitudinal cg location for both the 8510- and 9060-pound gross weights was at or near the forward limit of the envelope. There were several other instances during the test program where the magnitude of the 1/rev vertical vibration exceeded the 0.15g limit as specified in paragraph 3.7.1(b) of MIL-H-8501A. However, the amplitude of the 1/rev vertical vibration was perceptible by crew members when a value of 0.06g was realized and became irritating at levels above 0.10g. The measured value of the vertical 1/rev vibration became more severe towards the front of the cabin compartment (including cockpit) for all conditions tested. The magnitude of the vertical 1/rev vibration was reduced to an acceptable level by limiting the forward limit of the cg envelope to 128.7 and 126.5 inches at gross weights of 9500 and 8500 pounds, respectively (fig. A). It is assumed that if this limitation is observed during operational use, a distribution of fuselage mass will not be encountered that would yield unfavorable 1/rev vertical vibration characteristics.

Table 1. Vibration Test Conditions.

Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center-of-Gravity Location (in.)	Average Rotor Speed (rpm)	FLIR Sensor Configuration	Calibrated Airspeed Range (kt)
[1]9250	2500	128.0 (fwd)	322	Removed	Hover to 120
[1]9060	2500	127.8 (fwd)	320	Removed	Hover to 120
[1]8550	2600	127.3 (fwd)	322	Removed	Hover to 125
[1]9270	2500	126.5 (fwd)	322	Installed	Hover to 125
[1]9060	2500	126.3 (fwd)	322	Installed	Hover to 127
[1]8510	2500	125.7 (fwd)	320	Installed	Hover to 132
[1]8140	2350	128.6 (fwd)	322	Installed	Hover to 135
[1]8120	2400	128.9 (fwd)	322	Removed	Hover to 140
[2]7400	5100	127.5 (fwd)	320	Removed	Hover to 137
[2]7400	5000	135.7 (aft)	322	Removed	Hover to 137
[1]9320	2500	128.9 (fwd)	322	Installed	Hover to 127

[1]Tests conducted with the complete XM21 armament system installed.
[2]Tests conducted with only the armament mounting yoke and minigun/rocket mount assemblies installed.

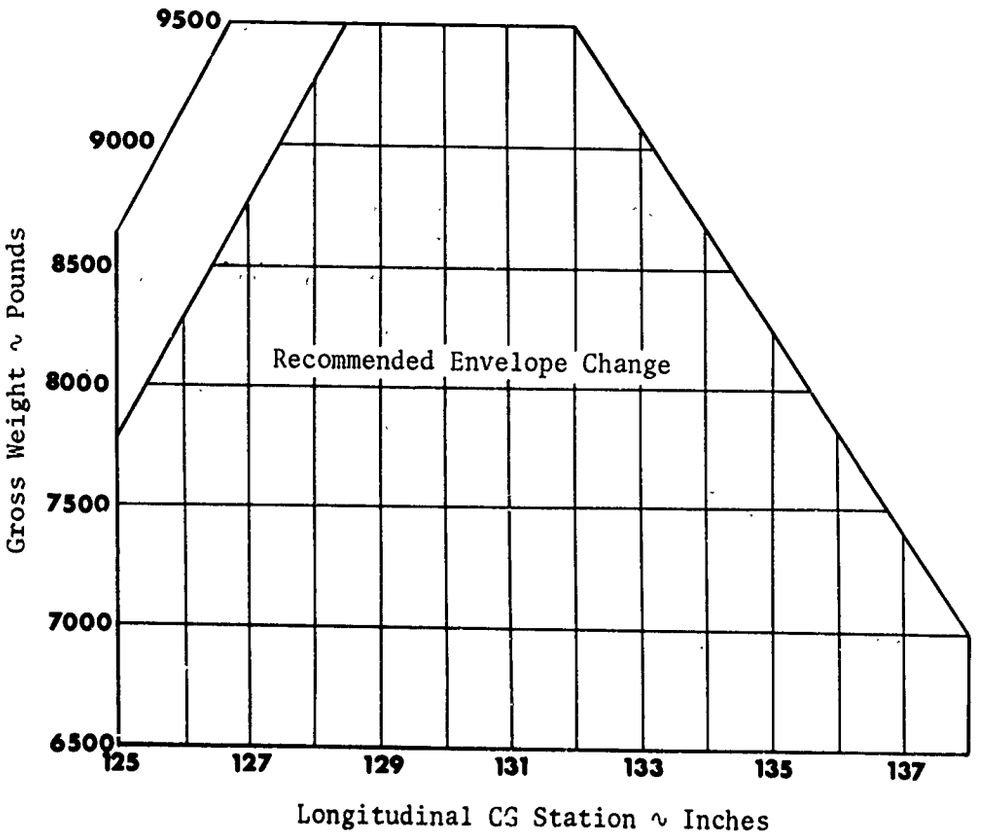


Figure A. Recommended Gross Weight Versus Longitudinal CG Station Envelope.

14. The amplitude of the vertical 1/rev vibration decreased rapidly to a tolerable level as airspeed was increased above 65 KCAS and remained nearly constant until V_H was achieved. At airspeeds in excess of V_H, the magnitude of the vertical 1/rev increased slightly with increasing airspeed but did not become irritating to crew members. The measured value of the vertical 1/rev increased with increasing gross weight and was unaffected by limited variations in density altitude (≃5000 feet). The 1/rev vertical vibration became more intense as aircraft rate of descent was increased for a given airspeed in diving flight (fig. 55, app IV).

2/Rev:

15. The amplitude of the vertical 2/rev vibration was generally below 0.15g at airspeeds less than V_H. The measured value of this harmonic did reach 0.31g at one isolated condition at the aircraft limit airspeed (V_L) in diving flight (fig. 38, app IV). The magnitude of the vertical 2/rev vibration increased slightly as airspeed was increased or decreased from approximately that airspeed where minimum power required for level flight occurred. The intensity of this harmonic was generally

greater in the forward area of the cabin compartment. The amplitude of the vertical 2/rev was not significantly affected by gross weight, limited density altitude changes, or rate-of-descent variations in diving flight at a given airspeed.

4/Rev:

16. The only difference noted when comparing similar data, both with the FLIR system installed and removed, was the peak amplitude of the 4/rev vibration harmonic. Peak values of this vertical vibration were generally greater with the FLIR system installed. Peak values of the vertical 4/rev vibration increased with increasing gross weight and/or increasing density altitude both with the FLIR system installed and removed. The magnitude of the vertical 4/rev harmonic was generally greater than the 0.15g limit as stated in paragraph 3.7.1(b) of MIL-H-8501A for a level flight airspeed range of 36 KCAS to V_H for gross weights greater than 8100 pounds. Characteristics of the 4/rev harmonic vibration between 40 and 80 KCAS in level flight were not perceptible to the flight crew since, in many cases, the vertical 4/rev characteristics were masked by the 1/rev vertical vibration. The masking effect was predominant at the low airspeed range of 36 to 65 KCAS. Effects of the 4/rev vertical vibration characteristics on mission equipment and airframe structures should be determined prior to operational deployment of the UH-1M/FLIR helicopter.

17. No general airspeed trend could be determined since the vertical 4/rev vibrational amplitude decreased with increasing airspeed at heavy gross weights (9000 to 9500 pounds) while the measured vibration values at the light gross weights (7600 to 8000 pounds) increased with increasing airspeed. Increasing rate of descent for a given airspeed had no significant effect on the 4/rev vertical vibration characteristics.

6/Rev:

18. The magnitude of the 6/rev vertical vibration was generally less than 0.10g for all conditions tested, except for isolated conditions at low airspeeds (40 to 60 KCAS) at FS 123.00. The peak measured value of this harmonic at this fuselage station was 0.15g in the 40 to 60 KCAS airspeed range. The 6/rev vertical vibration at this fuselage station increased with increasing gross weight, density altitude, and increasing rate of descent for a given airspeed in diving flight. The 6/rev vertical vibration values recorded at other locations were not significantly affected by gross weight, density altitude, or rate of descent.

8/Rev:

19. The measured values of the 8/rev vertical vibration were less than 0.285g, the limit specified in paragraph 3.7.1(b) of MIL-H-8501A for level flight. However, this limit was exceeded substantially in diving flight at FS 123.00. The 8/rev vertical vibration levels increased with increasing rate of descent for a given airspeed. This increasing 8/rev vertical vibration was perceptible but not irritating to the flight crew. A peak value of 0.71g was measured at 136 KCAS and a rate of descent

of 3500 feet per minute (ft/min) (fig. 58, app IV). The effect of the 8/rev vertical vibration characteristics during diving flight on the FLIR system mission equipment should be determined prior to operational deployment of the UH-1M/FLIR helicopter. Effect of rate of descent on the measured values of this harmonic decreased towards the forward portion of the cabin compartment. The amplitude of the 8/rev vertical vibration increased with decreasing gross weight, while variations in airspeed in level flight and modest changes in density altitude (≈5000 feet) had little or no effect.

10/Rev:

20. The 10/rev vertical vibration level was well below the 0.41g limit as stated in MIL-H-8501A. Peak values were measured in diving flight at the aft portion of the cargo compartment (FS 123.00). Gross weight and airspeed variations had no significant effect on the 10/rev vertical vibration characteristics.

Lateral Axis

General:

21. It was ascertained, by comparing data obtained under similar test conditions both with and without the FLIR system installed, that the FLIR system had a negligible influence on the lateral (right/left) vibration levels of all main rotor harmonics. Limited variations in density altitude (≈5000 feet) did not affect the lateral vibration characteristics. All of the lateral vibration levels were well within the limits presented in paragraph 3.7.1(b) of MIL-H-8501A. No lateral motion was perceived by the flight crew, except in diving flight at 125 KCAS and at light gross weight (7350 pounds).

1/Rev:

22. The magnitude of the 1/rev lateral vibration was more predominant towards the forward portion of the cabin compartment. Measured values of this harmonic increased with decreasing gross weight. The peak 1/rev lateral vibration measured was 0.095g at 125 KCAS (diving flight) and a gross weight of 7350 pounds (fig. 14, app IV). Changes in airspeed in level or diving flight only slightly affected the 1/rev lateral vibration characteristics. Increasing rate of descent at given airspeed resulted in an insignificant alteration of the measured level of this harmonic.

2/Rev:

23. The amplitude of the 2/rev lateral vibration increased towards the forward portion of the cabin compartment. Variations in gross weight, airspeed and/or rate of descent did not appreciably affect the measured values at this harmonic.

4/Rev:

24. Measured magnitudes of the 4/rev lateral vibration varied slightly with airspeed. Again, similar to the vertical 4/rev vibration, this harmonic reached a peak at the low airspeeds (40 to 50 KCAS) and then decreased as airspeed was increased to 70 KCAS, beyond which the amplitude remained generally constant until V_H was reached. At airspeeds in excess of V_H, the 4/rev lateral vibration again increased. Increasing gross weight caused the measured values to increase. The vibration levels for this harmonic were relatively constant throughout the pilot and passenger cabin area. Variations in rate of descent for a given airspeed had no appreciable effect.

6/Rev:

25. Increase in gross weight caused the magnitude of the 6/rev lateral vibration to increase. Measured values of this harmonic were larger in the aft portion of the passenger cabin compartment. Variations in airspeed and/or rate of descent did not influence the 6/rev lateral vibration characteristics.

8/Rev:

26. The amplitude of the 8/rev lateral vibration was generally greater towards the aft portion of the passenger cabin area. Variations in airspeed and increases in gross weight only affected the measured values of this harmonic slightly. The 8/rev lateral vibration increased in magnitude with increasing rate of descent for a given airspeed.

10/Rev:

27. The 10/rev lateral vibration characteristics were similar to the 8/rev lateral characteristics for all conditions, except that rate-of-descent variations did not influence the magnitude of this harmonic.

Longitudinal Axis

General:

28. It was established, by comparing data obtained under similar test conditions both with and without the FLIR system installed, that the FLIR system had a negligible effect on the longitudinal (fore/aft) vibration levels for the predominant main rotor harmonics. Modest variations in density altitude did not affect the longitudinal vibration characteristics. The longitudinal vibration levels encountered were within the limits of paragraph 3.7.1(b) of MIL-H-8501A, with one exception: the amplitudes of the 4/rev longitudinal vibration, during level flight, exceeded 0.15g (fig. 27, app IV). No longitudinal motion was noted by the flight crew during the test.

1/Rev:

29. The magnitude of the 1/rev longitudinal vibration reached a peak of 0.075g with the FLIR system installed at an airspeed of 50 KCAS (fig. 9, app IV). Measured amplitudes were generally less than 0.05g for all other test conditions. Variations in airspeed, gross weight and/or rate of descent did not significantly affect this vibration harmonic. The vibration levels of the 1/rev longitudinal were usually the same throughout the cabin compartment.

2/Rev:

30. Airspeed variations below 90 KCAS did not measurably affect the 2/rev longitudinal vibration levels; peak values of less than 0.10g were measured within this airspeed range. The magnitude of this vibration increased slightly as airspeed exceeded 90 KCAS. Variations in gross weight and/or changing rate of descent did not appreciably affect this vibration harmonic.

4/Rev:

31. The peak amplitude of the 4/rev longitudinal vibration was 0.365g at 41.5 KCAS at 9320 pounds (fig. 9, app IV). This vibration harmonic was sensitive to gross weight changes since there was a general tendency for the magnitude to increase with increasing gross weight. The measured values were larger towards the aft portion of the cargo compartment. Increasing airspeed in diving flight generally resulted in higher 4/rev longitudinal vibration levels.

6/Rev:

32. Increasing gross weight above 9000 pounds caused the longitudinal 6/rev vibration to increase. The peak value encountered for this harmonic was 0.135g at FS 123.00 for airspeeds of 36 and 50 KCAS in level flight (fig. 27, app IV). As airspeed was increased above 36 KCAS, the amplitude of this harmonic decreased. Variations in rate of descent had a negligible effect on the amplitude of the 6/rev longitudinal harmonic.

8/Rev:

33. The magnitude of the 8/rev longitudinal vibration was less than 0.10g in level flight and remained relatively constant throughout the level flight airspeed range. The measured value generally increased in diving flight at airspeeds in excess of 100 to 105 KCAS, depending on vibration sensor location and gross weight. A peak value of 0.215g was encountered in diving flight at an airspeed of 136 KCAS with a 3500 ft/min rate of descent (fig. 63, app IV). The vibration levels for this harmonic were generally larger in the aft portion of the passenger cabin.

10/Rev:

34. Longitudinal 10/rev magnitudes were less than 0.15g throughout the envelope tested. The measured values were generally more pronounced in the aft portion of the passenger area. Variations in airspeed and rate of descent had only a slight influence on the 10/rev longitudinal harmonic.

CONTRACTOR AND ARMY VIBRATION DATA COMPARISON

35. A comparison of previous contractor test results and data gathered during this evaluation are presented in tables 2 through 5. No definite trends could be determined from the overall correlation of these data. However, certain parameters for given airspeeds do indicate similar values for both sets of data. One contractor did not note the cg location, which caused difficulty in comparing data, especially for the vertical axis. Some of the disparity between contractor values and these test results may have been caused by different mass distribution for the various programs.

ELEVATOR LOADS

36. Elevator loads data were gathered simultaneously with the vibration tests. Elevator beam and chord bending as well as elevator torquing moment were measured on both elevators. The right elevator torquing moment sensor was inoperative during the entire test program, and repeated efforts to correct this defect proved fruitless. Other elevator load instrumentation periodically failed during a flight but was repaired prior to each succeeding flight. The data for these parameters are presented in figures 64 through 94, appendix IV. A sign convention used to display these data is presented in figure B.

37. The installation of the FLIR system and variations in gross weights had a negligible effect on the elevator loads. Analysis of elevator flight loads revealed a slight increase in mean and oscillatory beam bending moment values when compared to the UH-1C/M21 test results presented in reference 8, appendix I. The chordwise and torquing moments were approximately the same as those encountered during previous test results.

Beam Bending Moment

38. The beam bending moment on the right elevator was generally higher when compared to the left elevator. This difference in flight loads was 2 to 3 percent at low airspeeds (40 to 60 KCAS), and 11 to 13 percent at V_L. The peak oscillating moment on the right elevator was 6800 inch-pounds (in.-lb) at an airspeed near V_L (fig. 67, app IV), and the peak mean moment of the same elevator was a negative 8800 in.-lb load (down: applied at the tip) at V_L (fig. 65). Both the mean and oscillating moments were increased when the flight regime was changed from autorotation to climbing flight. The oscillating beam bending

Table 2. Pilot Vertical Vibration Data Comparison.

Average Density Altitude: 2500 feet
Average Rotor Speed: 324 rpm

Calibrated Airspeed (kt)	FLIR Configuration	Contractor Test Results[1]				Army Test Results			
		Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]		Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level	
				1/rev (g)	2/rev (g)			1/rev (g)	2/rev (g)
85	Installed	9507	125.6 (fwd)	0.032	0.055	9280	126.5 (fwd)	0.010	0.053
104	Installed	9507	125.6 (fwd)	0.035	0.105	9280	126.5 (fwd)	0.020	0.062
123.5	Installed	9507	125.6 (fwd)	0.040	0.068	9210	126.4 (fwd)	0.030	0.070
85	Removed	8209	129.0 (mid)	0.022	0.055	8120	128.9 (mid)	0.080	0.078
104	Removed	8209	129.0 (mid)	0.038	0.110	8120	128.9 (mid)	0.100	0.140
123.5	Removed	8209	129.0 (mid)	0.040	0.135	8030	128.8 (mid)	0.090	0.265

[1]Data derived from reference 6, appendix I.
[2]Data presented for single amplitude.

Table 3. Bulkhead 23.00 Vertical Vibration Data Comparison.

Average Density Altitude: 2500 feet
Average Rotor Speed: 324 rpm

Calibrated Airspeed (kt)	FLIR Configuration	Contractor Test Results[1]					Army Test Results				
		Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]			Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]		
				1/rev (g)	2/rev (g)	4/rev (g)			1/rev (g)	2/rev (g)	4/rev (g)
80	Installed	9300	–	–	0.18	0.70	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.025	0.045 0.030	0.010 0.145
103	Installed	9300	–	–	0.16	0.23	9280 9320	126.5 (fwd) 128.9 (mid)	0.040 0.020	0.090 0.090	0.015 0.050
80	Installed	8500	–	0.11	0.14	0.19	8510 8160	125.7 (fwd) 128.6 (mid)	0.020 0.045	0.045 0.065	0.102 0.050
100	Installed	8500	–	0.12	0.22	0.22	8510 8160	125.7 (fwd) 128.6 (mid)	0.035 0.070	0.100 0.100	0.035 0.080
80	Installed	9300	–	–	0.225	0.56	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.025	0.045 0.030	0.010 0.145
100	Installed	9300	–	–	0.245	0.255	9280 9320	126.5 (fwd) 128.9 (mid)	0.040 0.020	0.090 0.090	0.015 0.050

[1]Data derived from reference 7, appendix I.
[2]Data presented for single amplitude.

Table 4. Bulkhead 23.00 Lateral Vibration Data Comparison.

Average Density Altitude: 2500 feet
Average Rotor Speed: 324 rpm

Calibrated Airspeed (kt)	FLIR Configuration	Contractor Test Results[1]					Army Test Results				
		Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]			Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]		
				1/rev (g)	2/rev (g)	4/rev (g)			1/rev (g)	2/rev (g)	4/rev (g)
80	Installed	9300	–	0.12	0.175	0.27	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.015	0.055 0.065	0.010 0.025
103	Installed	9300	–	0.10	0.100	0.24	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.042	0.060 0.045	0.040 0.040
80	Installed	8500	–	0.12	0.12	–	8510 8160	125.7 (fwd) 128.6 (mid)	0.020 0.015	0.055 0.075	0.020 0.035
100	Installed	8500	–	0.095	–	–	8510 8160	125.7 (fwd) 128.6 (mid)	0.022 0.045	0.070 0.060	0.045 0.055
80	Installed	9300	–	0.125	–	0.23	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.015	0.055 0.065	0.010 0.025
100	Installed	9300	–	0.105	–	0.18	9280 9320	126.5 (fwd) 128.9 (mid)	0.020 0.042	0.060 0.045	0.040 0.040

[1]Data derived from reference 7, appendix I.
[2]Data presented for single amplitude.

Table 5. Bulkhead 23.00 Longitudinal Vibration Data Comparison.

Average Density Altitude: 2500 feet
Average Rotor Speed: 324 rpm

Calibrated Airspeed (kt)	FLIR Configuration	Contractor Test Results[1]						Army Test Results					
		Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]				Average Gross Weight (lb)	Longitudinal Center-of-Gravity Station (in.)	Vibration Level[2]			
				1/rev (g)	2/rev (g)	4/rev (g)	10/rev (g)			1/rev (g)	2/rev (g)	4/rev (g)	10/rev (g)
80	Installed	9300	–	–	0.085	0.14	0.50	9280 9320	126.5 (fwd) 128.9 (mid)	0.010 0.005	0.010 0.012	0.080 0.062	0.030 0.018
103	Installed	9300	–	–	0.125	0.22	0.82	9280 9320	126.5 (fwd) 128.9 (mid)	0.008 0.010	0.030 0.030	0.015 0.040	0.025 0.025
80	Installed	8500	–	–	0.18	–	–	8510 8160	125.7 (fwd) 128.6 (mid)	0.005 0.005	0.015 0.025	0.055 0.040	0.010 0.035
100	Installed	8500	–	–	0.23	–	–	8510 8160	125.7 (fwd) 128.6 (mid)	0.005 0.015	0.032 0.065	0.045 0.035	0.020 0.045
80	Installed	9300	–	–	0.29	0.33	0.18	9280 9320	126.5 (fwd) 128.9 (mid)	0.010 0.005	0.010 0.012	0.080 0.062	0.030 0.018
100	Installed	9300	–	–	0.11	0.29	0.135	9280 9320	126.5 (fwd) 128.9 (mid)	0.008 0.010	0.030 0.030	0.015 0.040	0.025 0.025

[1]Data derived from reference 7, appendix I.
[2]Data presented for single amplitude.

moment increased with increasing rate of descent for a given airspeed in diving flight. The primary frequency of the oscillating moment was approximately 44 Hertz (Hz) which corresponds to the 8/rev harmonic of the main rotor. The amplitude of the 8/rev vibration harmonic also increased in diving flight. The interaction of the 8/rev vibration characteristics and the oscillating elevator beam bending moment during diving flight should be thoroughly investigated to determine the fatigue and structural implications prior to deploying the UH-1M/FLIR helicopter for service use. The mean moment, however, generally decreased with increasing rate of descent. A modest increase in density altitude (≈5000 feet) caused the oscillatory and mean measured values to increase for a given airspeed.

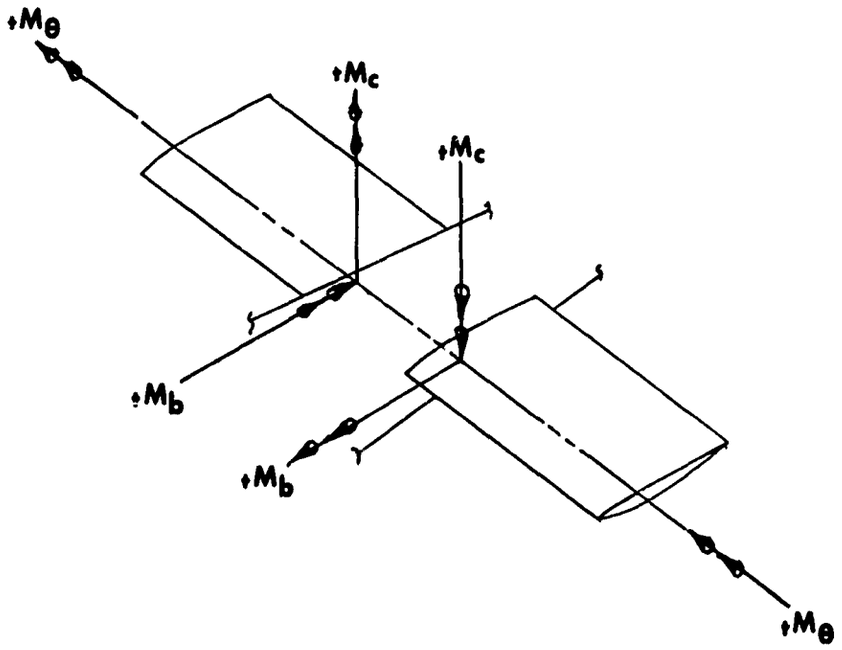


Figure B. Elevator Moment Sign Convention.

Chord Bending Moment

39. The left elevator chord bending moment was slightly greater when compared to the right elevator at airspeeds above approximately 100 KCAS. At airspeeds below 100 KCAS, load values measured on both elevators were similar. The peak mean and oscillating chord moments were a negative 900 in.-lb load (aft: applied at the tip) at V_H (fig. 85, app IV), and 2400 in.-lb at V_L (fig. 87), respectively. Changing the flight profile from autorotation to climbing flight resulted in a slight increase in the magnitude of the chord bending moment. Increasing rate of descent at high speed (110 to 130 KCAS) caused the mean moment levels to decrease and the oscillatory moments to increase. A limited variation in density altitude resulted in a slight variation in this load parameter.

Elevator Torquing Moment

40. The magnitudes of elevator torquing moment increased as 90 KCAS was exceeded, and for airspeeds of less than 90 KCAS, very little change in amplitude was measured. Peak oscillating moment on the left elevator was 930 in.-lb at V_L in diving flight (fig. 91, app IV). The largest mean moment value was 1270 in.-lb in the leading-edge-up direction during autorotation at an airspeed of 87.5 KCAS (fig. 90). The measured value of the oscillating moment was greater in climbing flight when compared to autorotation for the same airspeed. Increasing rate of descent in diving flight caused the mean torquing moment to decrease, while no change was noted in the oscillating load.

CONCLUSIONS

41. With the exception of the 4/rev vertical, the vibration characteristics were unaltered by installing or removing the FLIR system (paras 12, 16, 21, and 28).

42. Peak magnitudes of the vertical 4/rev vibration were generally higher with the FLIR system installed (paras 12 and 16).

43. The magnitudes of the 1/rev vertical vibration with and without the FLIR system installed were excessive when operating at or near the forward cg limit in stabilized level flight within the airspeed range from 40 to 65 KCAS (para 13).

44. The amplitude of the 4/rev vertical harmonic was greater than the 0.15g limit stated in paraagraph 3.7.1(b) of MIL-H-8501A for a level flight airspeed range of 36 KCAS to V_H for gross weights greater than 8100 pounds (para 16).

45. In diving flight, the magnitude of the 8/rev vertical vibration at FS 123.00 exceeded the limits of MIL-H-8501A and reached a peak value of 0.81g at an airspeed of 136 KCAS and a descent rate of 3500 ft/min (para 19).

46. The vibration levels in the lateral axis were within the limits of paragraph 3.7.1(b) of MIL-H-8501A (para 21).

47. The longitudinal vibration levels encountered were less than the limit presented in paragraph 3.7.1(b) of MIL-H-8501A, with the exception of the 4/rev longitudinal vibration harmonic (para 28).

48. The amplitude of the longitudinal 4/rev vibration harmonic exceeded the 0.15g limit by 0.215g at an airspeed of 42 KCAS (para 31).

49. Elevator flight loads without the FLIR system installed indicated a slight increase in elevator beam bending moment when compared to previous UH-1C/M21 test results (para 37).

50. The installation of the FLIR system had a negligible effect on the elevator loads when compared to data acquired under similar test conditions with the FLIR system removed (para 37).

51. The oscillating beam bending moment of the elevator increased with increasing airspeed in diving flight. The primary frequency of this oscillation was 44 Hz, which corresponded to the 8/rev harmonic of the main rotor (para 38).

RECOMMENDATIONS

52. The forward cg limit should be moved aft to reduce the 1/rev vertical vibration to acceptable levels (para 13).

53. The effects of the 4/rev and 8/rev vertical vibration characteristics on the FLIR system mission equipment and airframe structures should be determined prior to operational deployment of the UH-1M/FLIR helicopter (paras 16 and 19).

54. The interaction of the 8/rev vibration characteristics and the oscillating elevator beam bending moment during diving flight should be thoroughly investigated to determine the fatigue and structural implications prior to deploying the UH-1M/FLIR helicopter for operational use (para 38).

APPENDIX I. REFERENCES

1. Letter, USAAVSCOM, AMSAV-R-F, 21 September 1970, subject: Vibration Survey of the UH-1M/FLIR.

2. Technical Manual, TM 55-1520-220-10, *Operator's Manual, Army Model UH-1C/M Helicopter,* November 1968, with Change 1, September 1969.

3. Report, Hughes Aircraft Company, Report No. HAC 70-24-6930, *Aircraft Modification of the UH-1M/FLIR System,* April 20, 1970.

4. Military Specification, MIL-H-8501A, *Helicopter Flying and Ground Handling Qualities; General Requirements For,* 7 September 1961, with Amendment 1, 3 April 1962.

5. Message, USAAVSCOM, AMSAV-R-FT, 09-11, 16 September 1970, Unclas, subject: Safety of Flight Release for Testing the Hughes UH-1M/FLIR System.

6. Report, Bell Helicopter Company, Report No. 204-100-167, *Non-Functional Flight Testing of the Model C19A Forward Looking Infrared Fire Control System on the UH-1C Helicopter,* 21 September 1968.

7. Letter Report, Hughes Aircraft Company, Report No. DOC 2118.10/713, *Low Frequency Characteristics of the INFANT and FLIR Equipped UH-1's,* 12 August 1970.

8. Report, Bell Helicopter, Report No. 204-100-114, *Qualification Flight Testing of the Combination M-5 Weapon System with Various Side Mounted Weapon Systems Installed on the UH-1B Equipped with a 540 Rotor System,* 7 December 1965.

APPENDIX II. TEST TECHNIQUES AND DATA REDUCTION PROCEDURES

WEIGHT AND BALANCE

1. The aircraft, with instrumentation installed, was weighed prior to the initial flight of the test program both with and without the FLIR system sensor installed. The weighings were performed under the following conditions:

a. Engine and transmission full of oil.

b. Trapped fuel drained.

c. Empty ammunition boxes for miniguns installed.

d. XM21 armament mounting yoke installed.

2. The fuel load of the aircraft was determined by using the standard fuel quantity indicator in the cockpit. This indicator was not calibrated; however, based on previous experience, the fuel load values measured by this instrument were within 50 pounds of the actual value. Helicopter loadings and cg's were controlled by installation of ballast at various locations in the aircraft.

VIBRATION

3. Vibration tests were performed at various combinations of gross weight, cg and flight conditions both with and without the FLIR system installed. Density altitude and rotor speed were held constant for each combination of gross weight and cg condition until the airspeed range was adequately investigated to determine vibration characteristics.

4. To determine the components of the aircraft vibration levels at the fundamental frequency (1/rev) of the main rotor and at the 2/rev, 4/rev, 6/rev, 8/rev, and 10/rev harmonics of the main rotor frequency, the vibration data were Fourier analyzed. This analysis was accomplished by using digital sampling of the data at equal time intervals to produce time series of discrete samples. These time series represent the continuous vibration data for all frequencies less than one-half of the sampling rate. From these time series, the discrete Fourier transform was calculated by use of a fast Fourier transform algorithm. The program output gave the g level at each rotor harmonic. This g output level was one-half of the peak-to-peak value and is referred to in the report as single amplitude g level.

ELEVATOR LOADS

5. Elevator loads data were gathered simultaneously with the vibration tests. Elevator beam and chord bending moment as well as elevator torquing moment were measured. The peak oscillating and mean loads were determined for each trimmed condition.

APPENDIX III. TEST INSTRUMENTATION

The data presented in this report were gathered from both sensitive and standard production aircraft instrumentation. All sensitive instrumentation was calibrated and installed prior to the start of the test program. The aircraft production instrumentation was not calibrated and an instrument error of zero was assumed. Instrumented left and right elevators, to measure flight loads, were calibrated and provided by Bell Helicopter Company for installation on the test aircraft. The following parameters were measured:

OSCILLOGRAPH

Pilot panel vertical vibration sensor (photo 1)
Pilot seat vertical vibration sensor (photo 2)
Pilot seat lateral vibration sensor (photo 2)
Bulkhead at FS 23.00 vertical vibration sensor (photo 3)
Bulkhead at FS 23.00 lateral vibration sensor (photo 3)
Bulkhead at FS 23.00 longitudinal vibration sensor (photo 3)
Bulkhead at FS 123.00 vertical vibration sensor (photo 4)
Bulkhead at FS 123.00 lateral vibration sensor (photo 4)
Bulkhead at FS 123.00 longitudinal vibration sensor (photo 4)
Right elevator beam bending at elevator station (ES) 12.25 right
Right elevator chord bending at ES 12.25 right
Right elevator torquing moment at ES 13.75 right
Left elevator beam bending at ES 12.25 left
Left elevator chord bending at ES 12.25 left
Left elevator torquing moment at ES 13.75 left
Rotor blip

PILOT PANEL (Production Instruments)

Airspeed
Altimeter
Outside air temperature
Fuel quantity
Rotor speed
Rate of descent

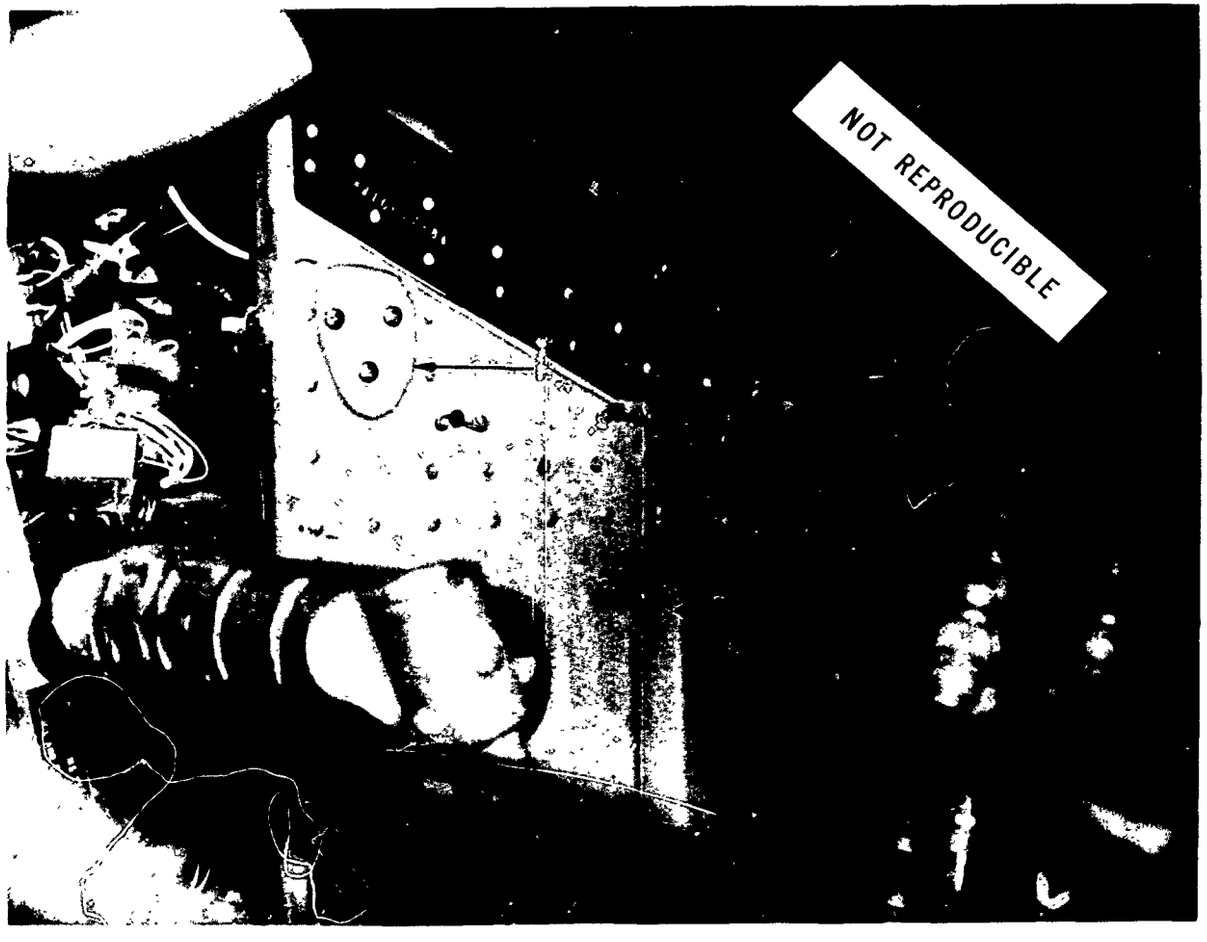


Photo 1. **Location of Vertical Vibration Sensor on Pilot Panel at FS 23.0, WL 32.0, BL 10.0 right.**

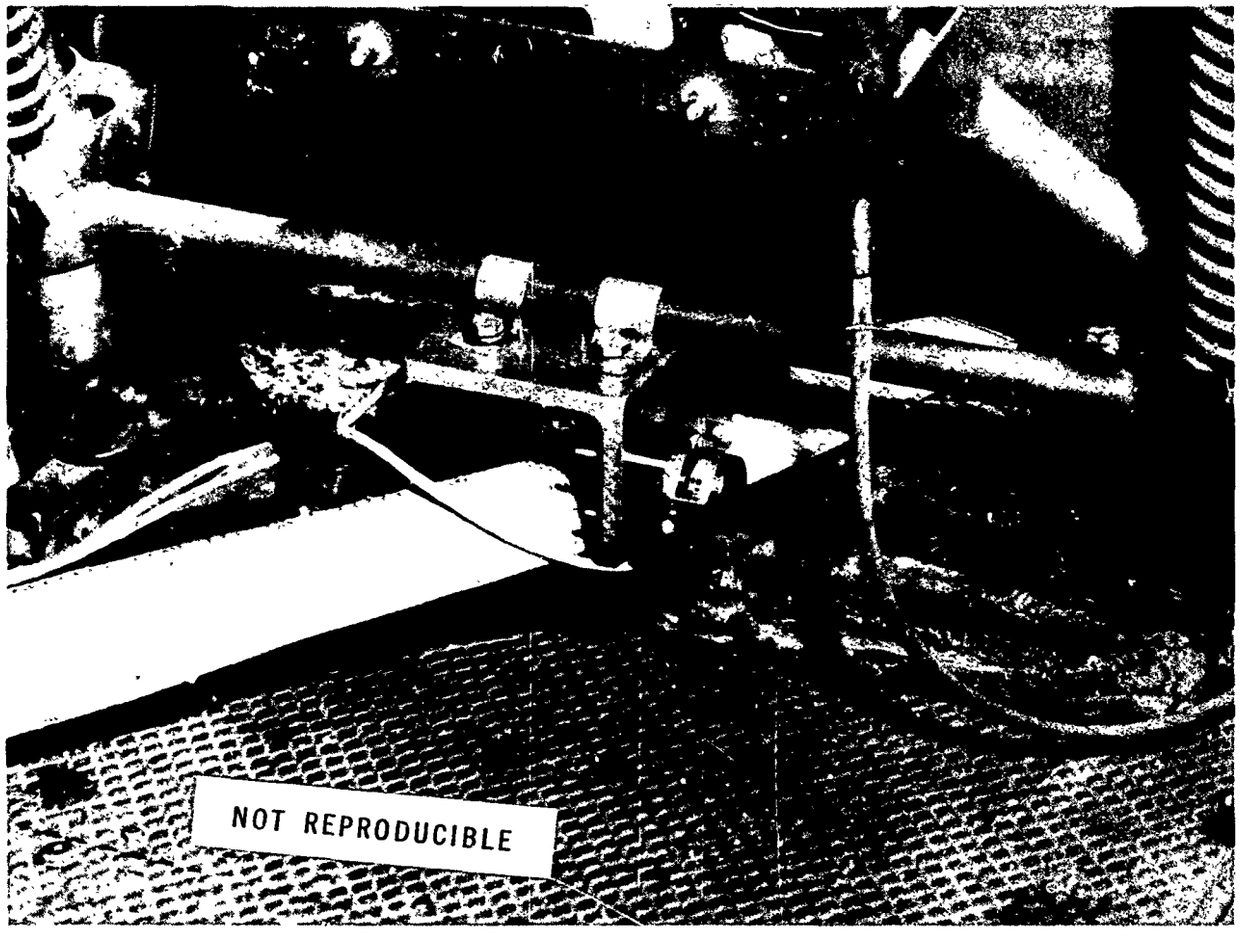


Photo 2. **Location of Vertical and Lateral Vibration Sensors on Pilot Seat at FS 61.0, WL 28.0, BL 21.0 right.**

Photo 3. Location of Vertical, Lateral and Longitudinal Sensors on Bulkhead at FS 23.0, WL 19.0, BL 22.0 left.

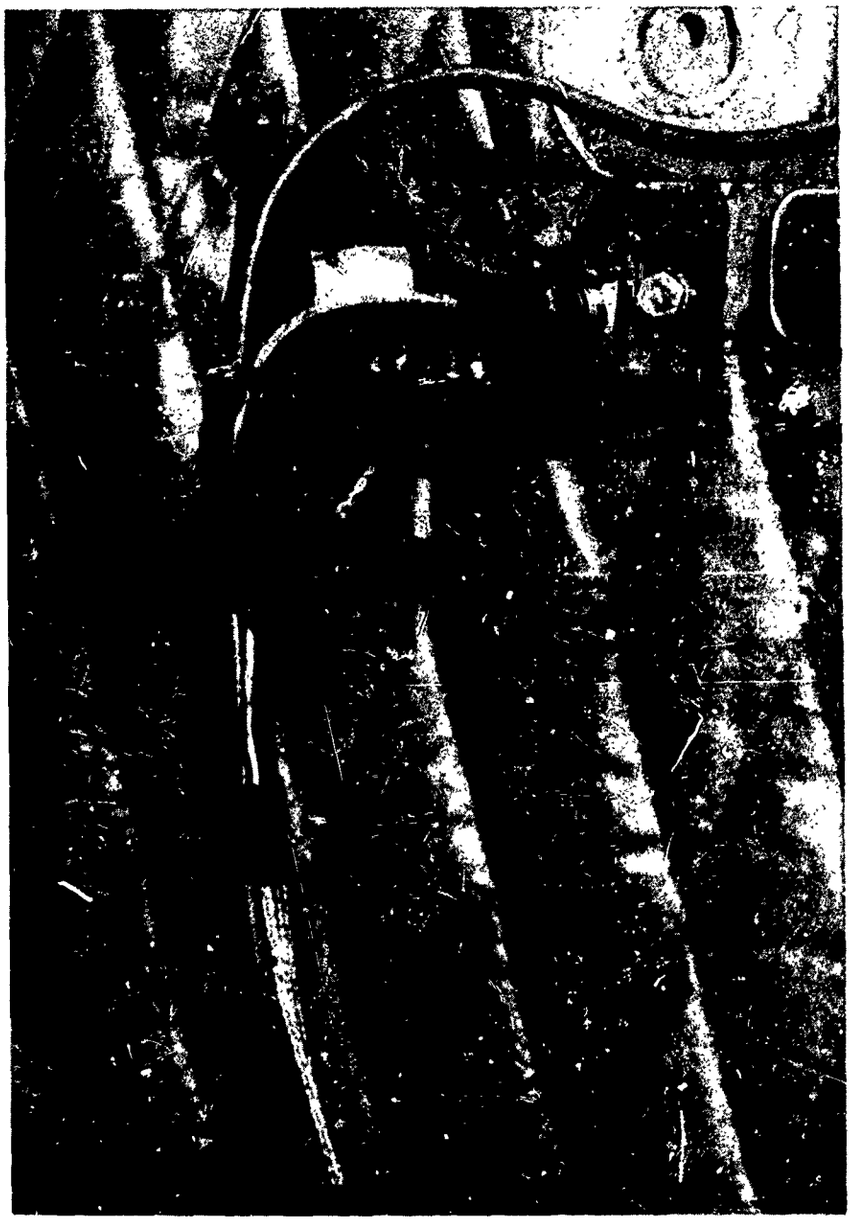


Photo 4. **Location of Vertical, Lateral and Longitudinal Sensors on Bulkhead at FS 123.0, WL 60.0, BL 40.0 left.**

APPENDIX IV. TEST DATA

INDEX

FIGURE 1

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

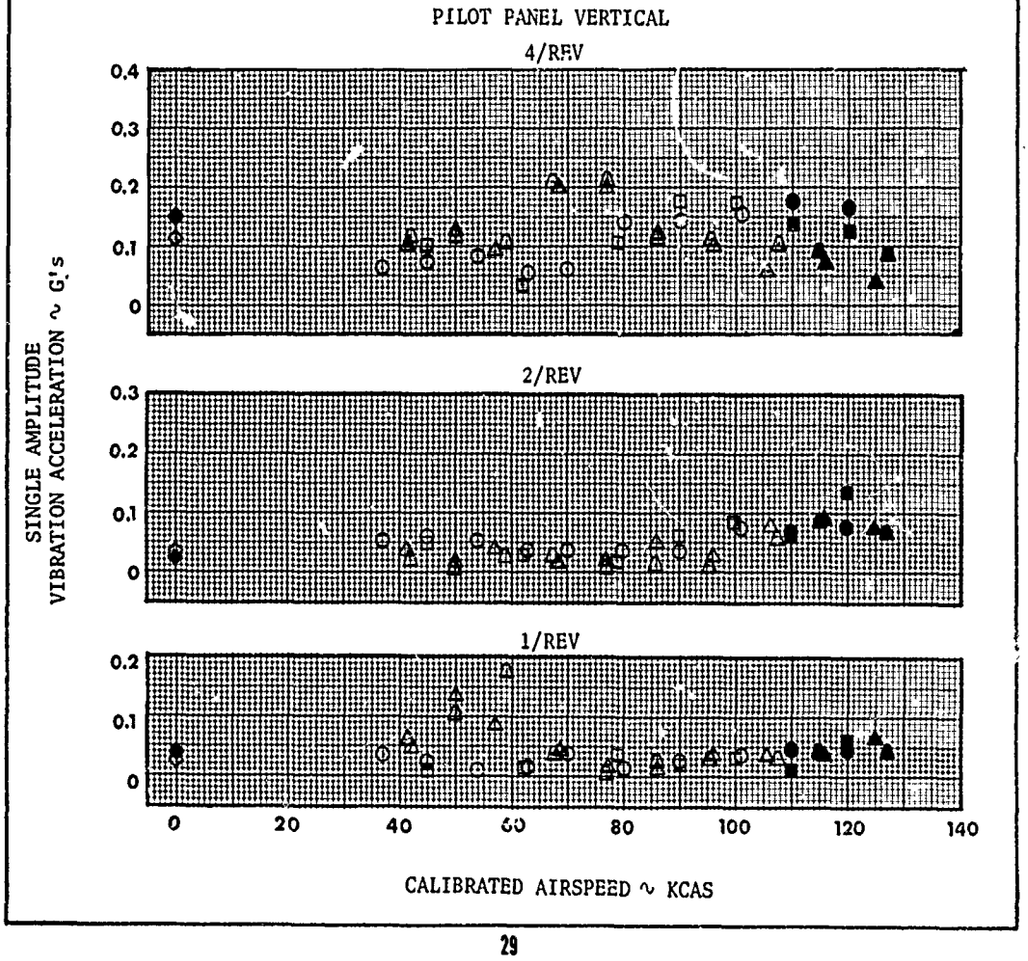


FIGURE 1 (CONTINUED)

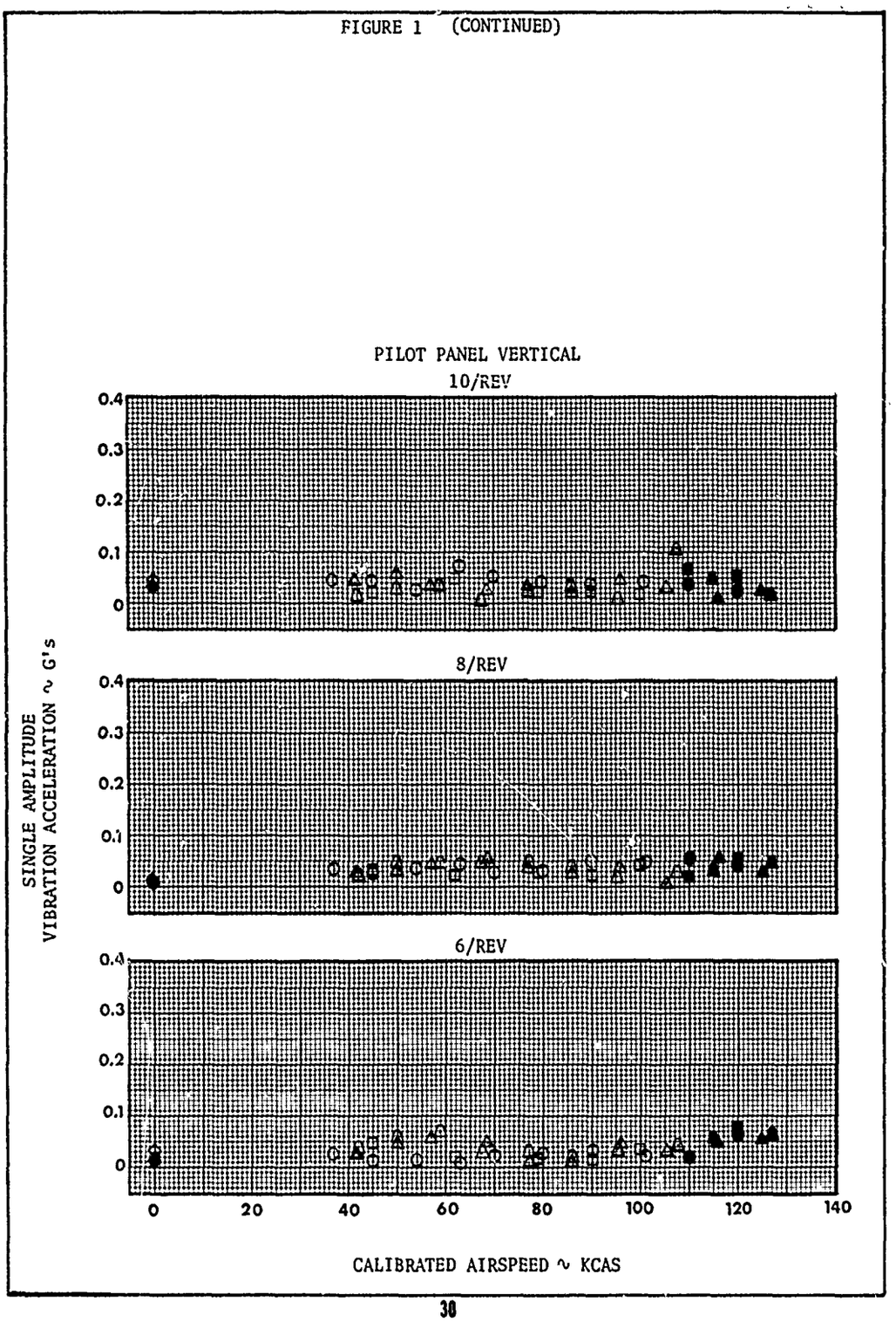


FIGURE 2
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

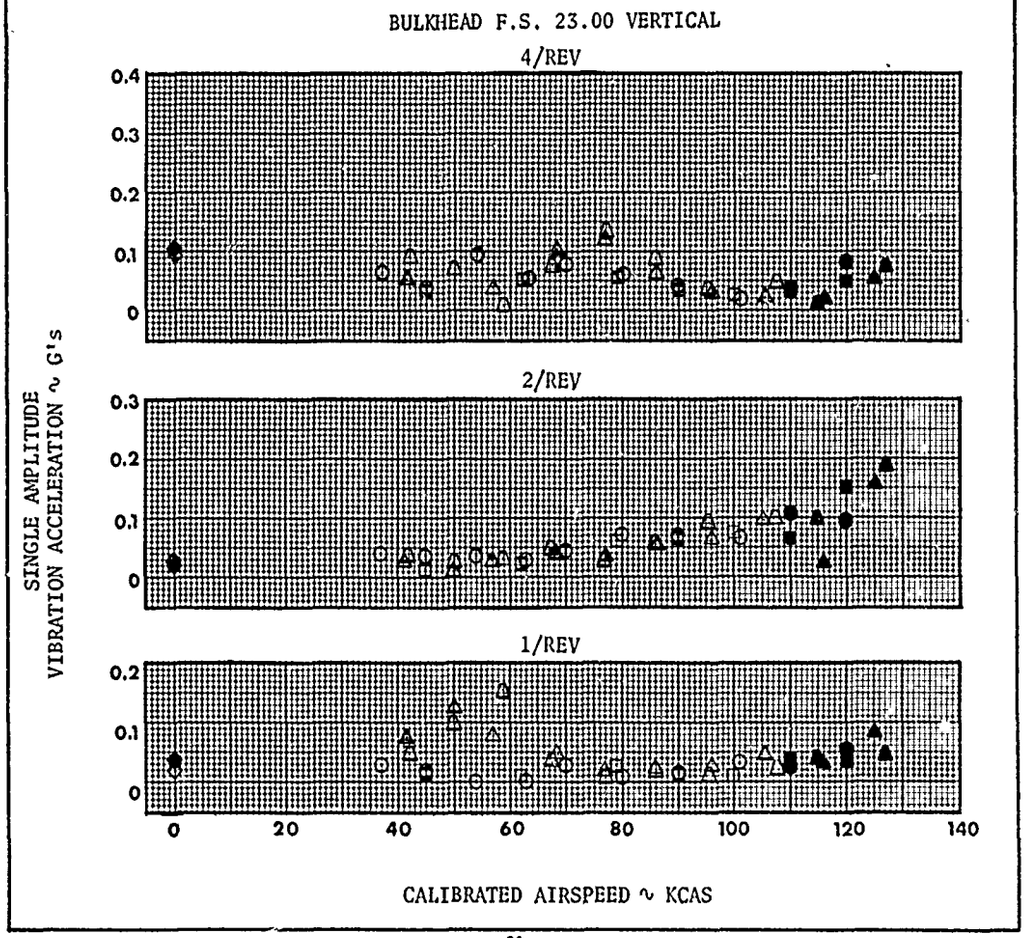


FIGURE 2 (CONTINUED)

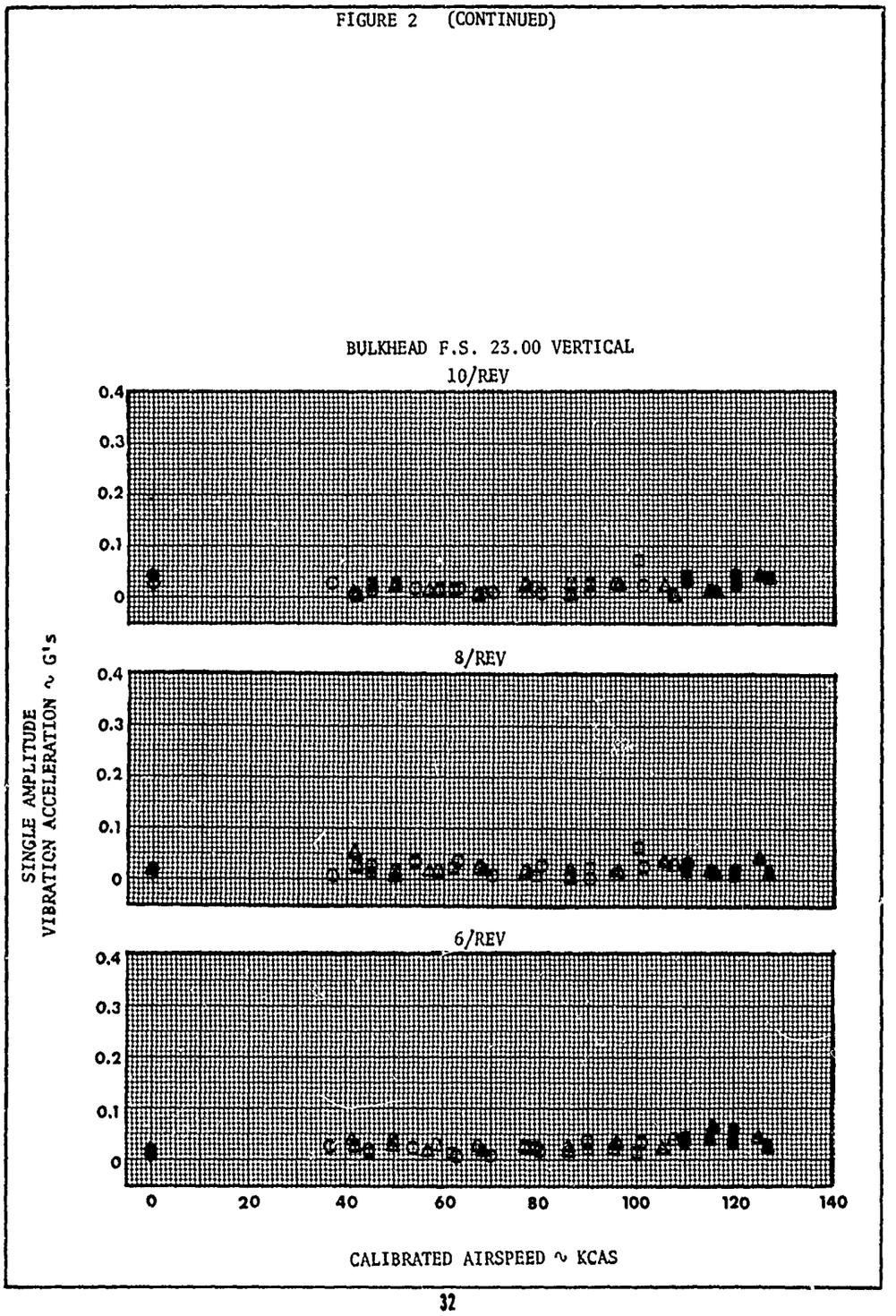
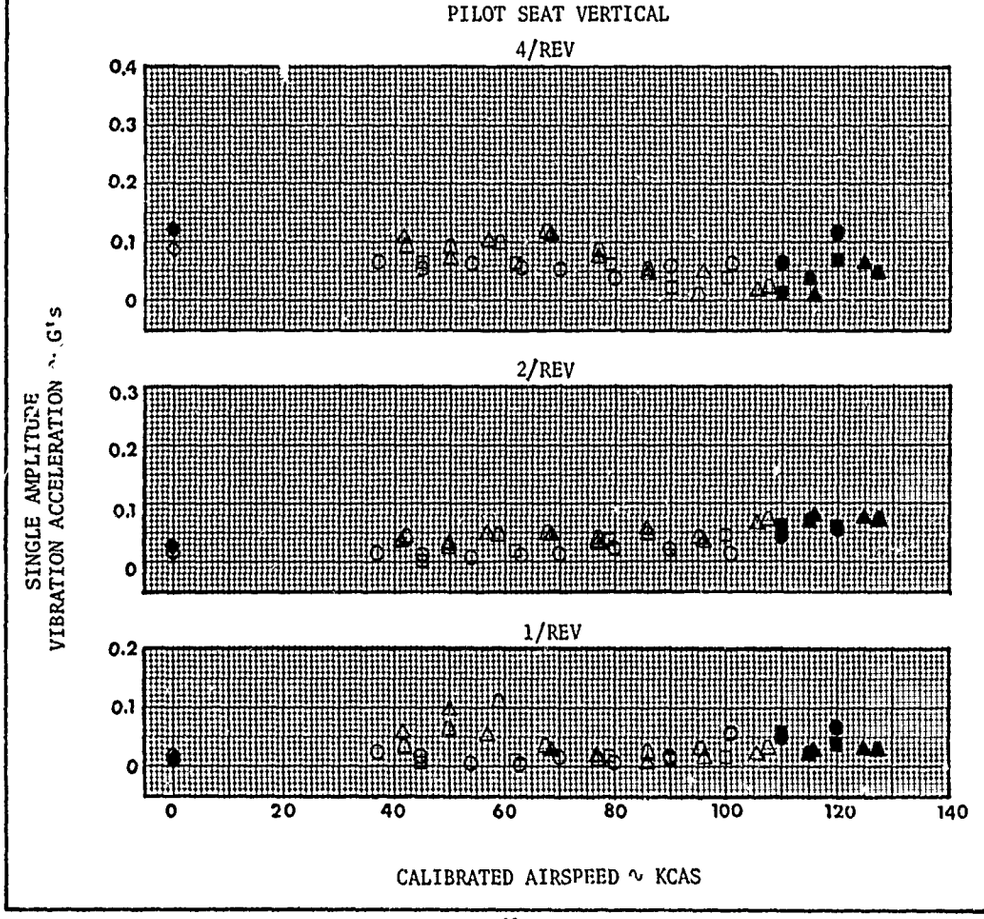


FIGURE 3

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT



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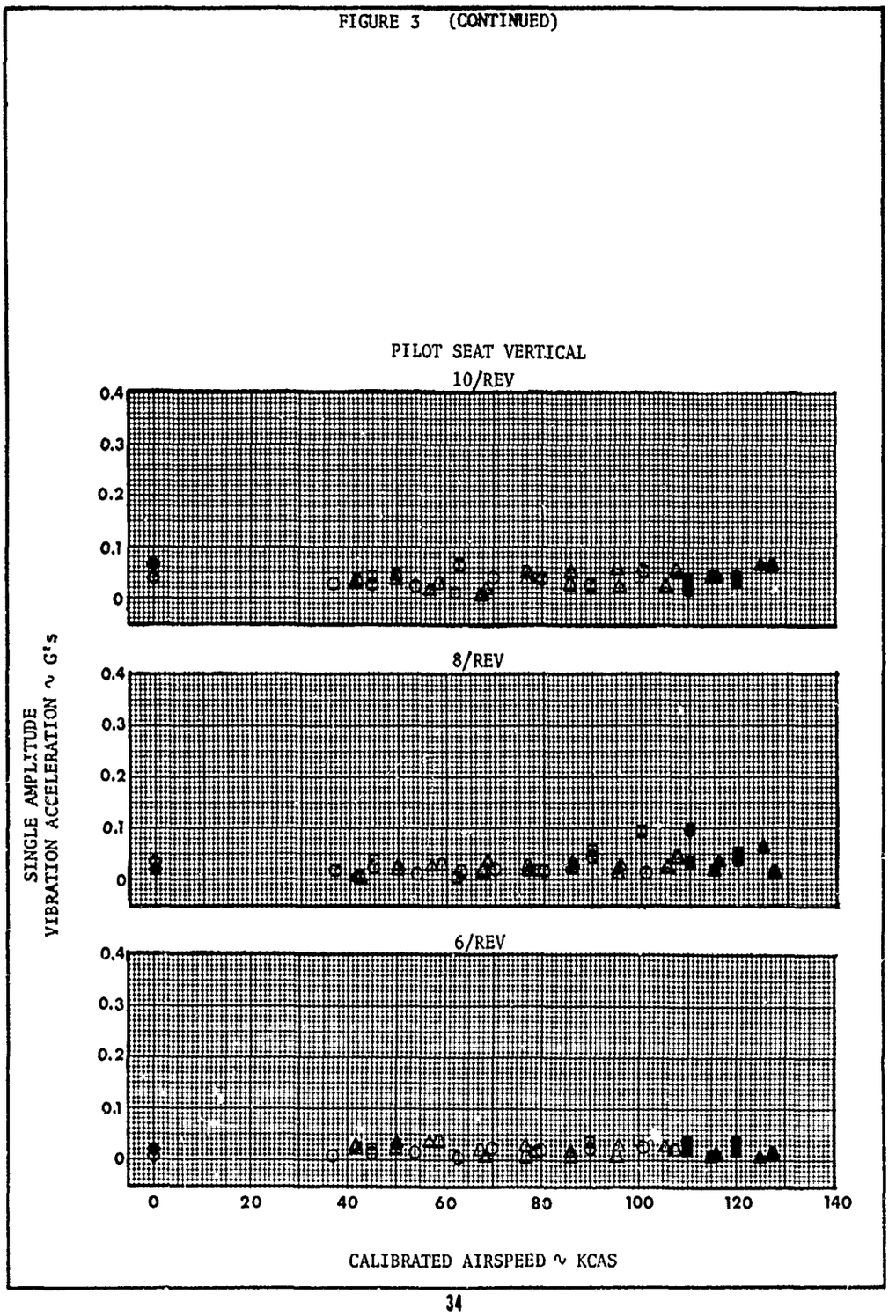
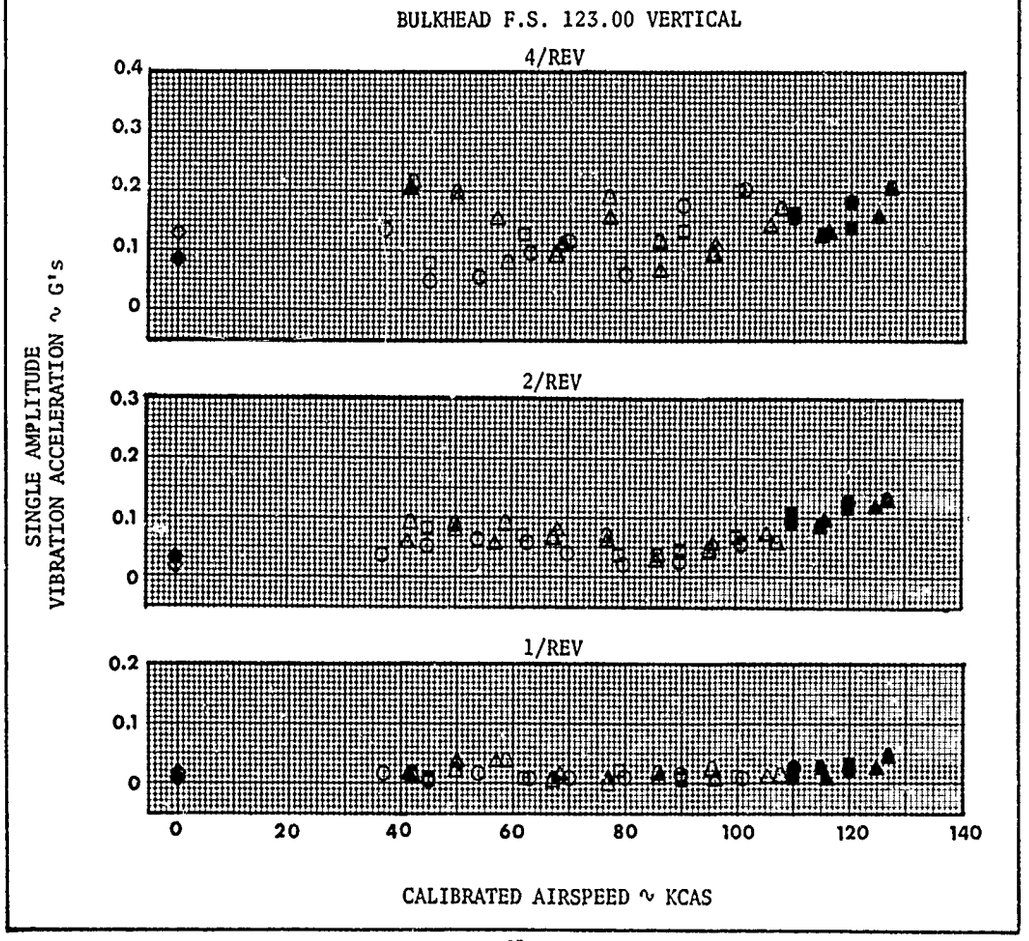


FIGURE 4

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT



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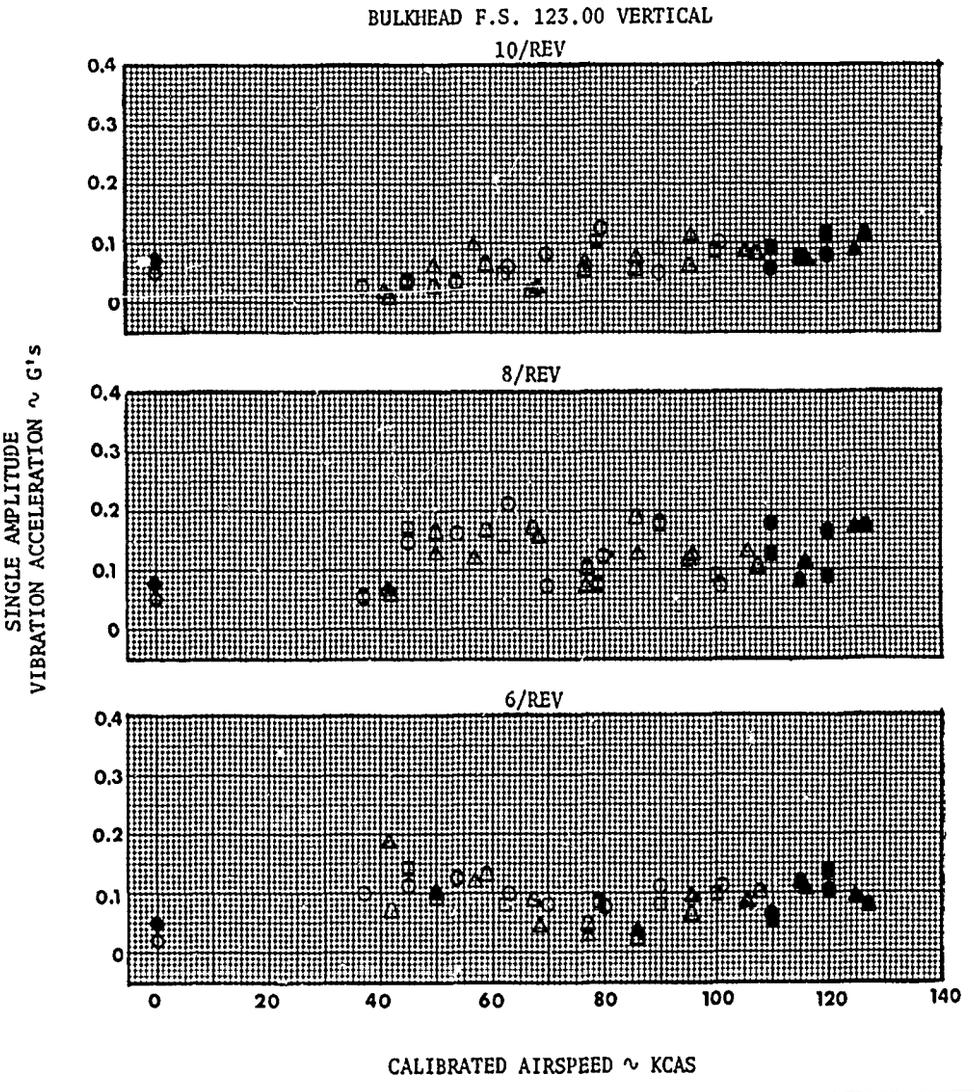


FIGURE 5

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

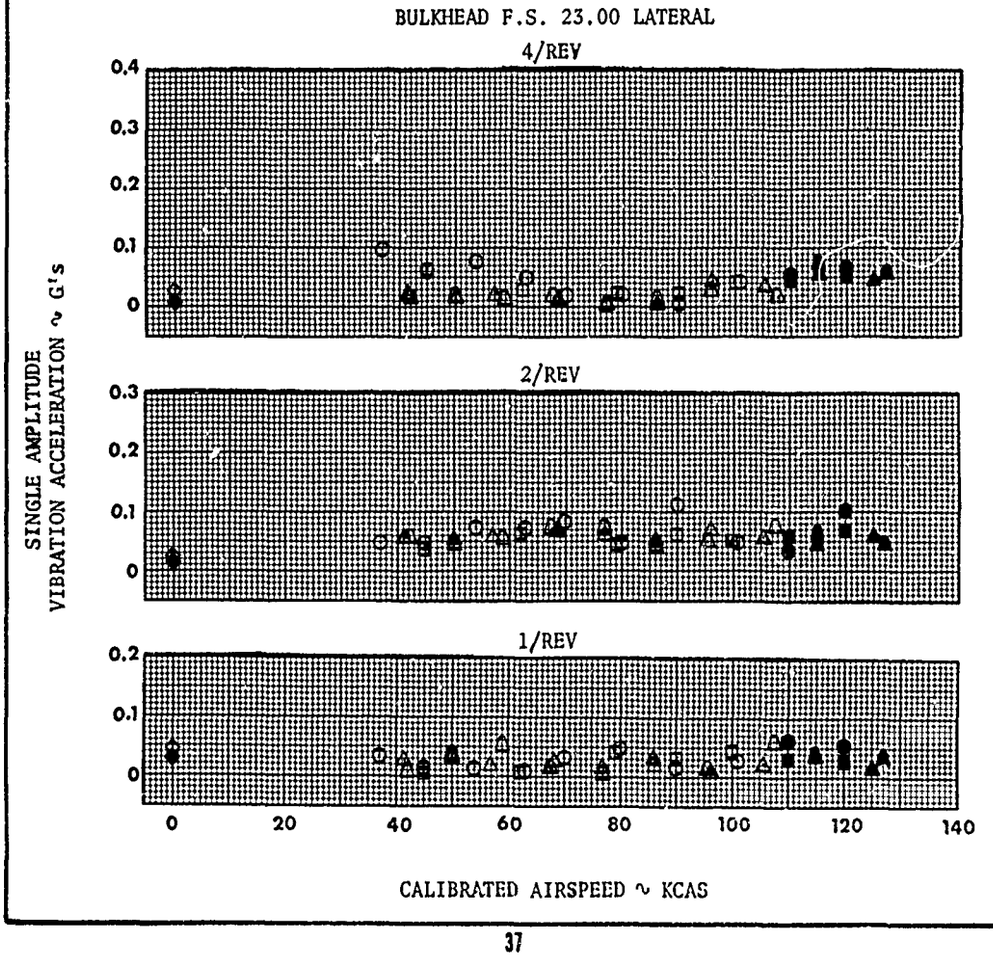


FIGURE 5 (CONTINUED)

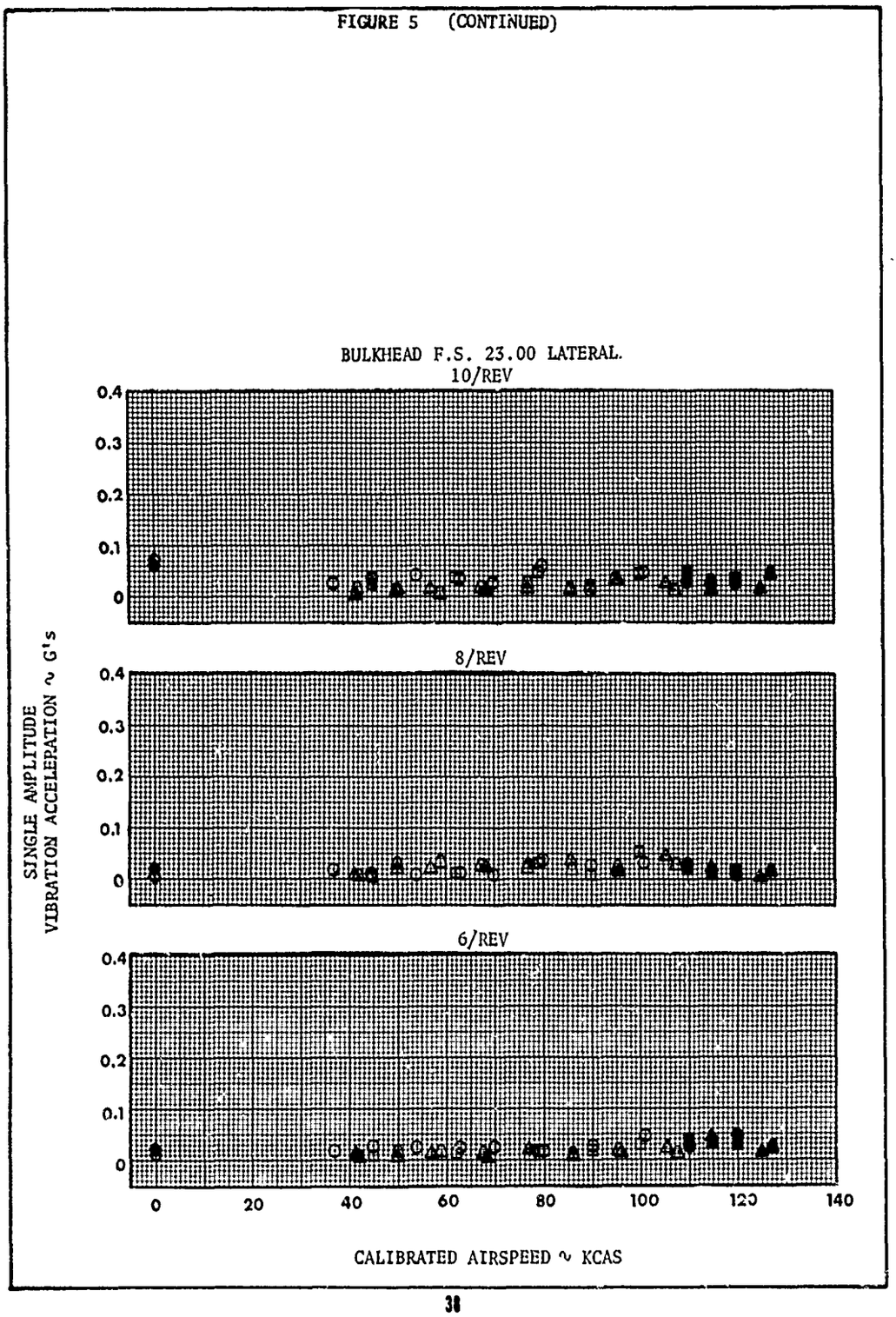


FIGURE 6
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
▵	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

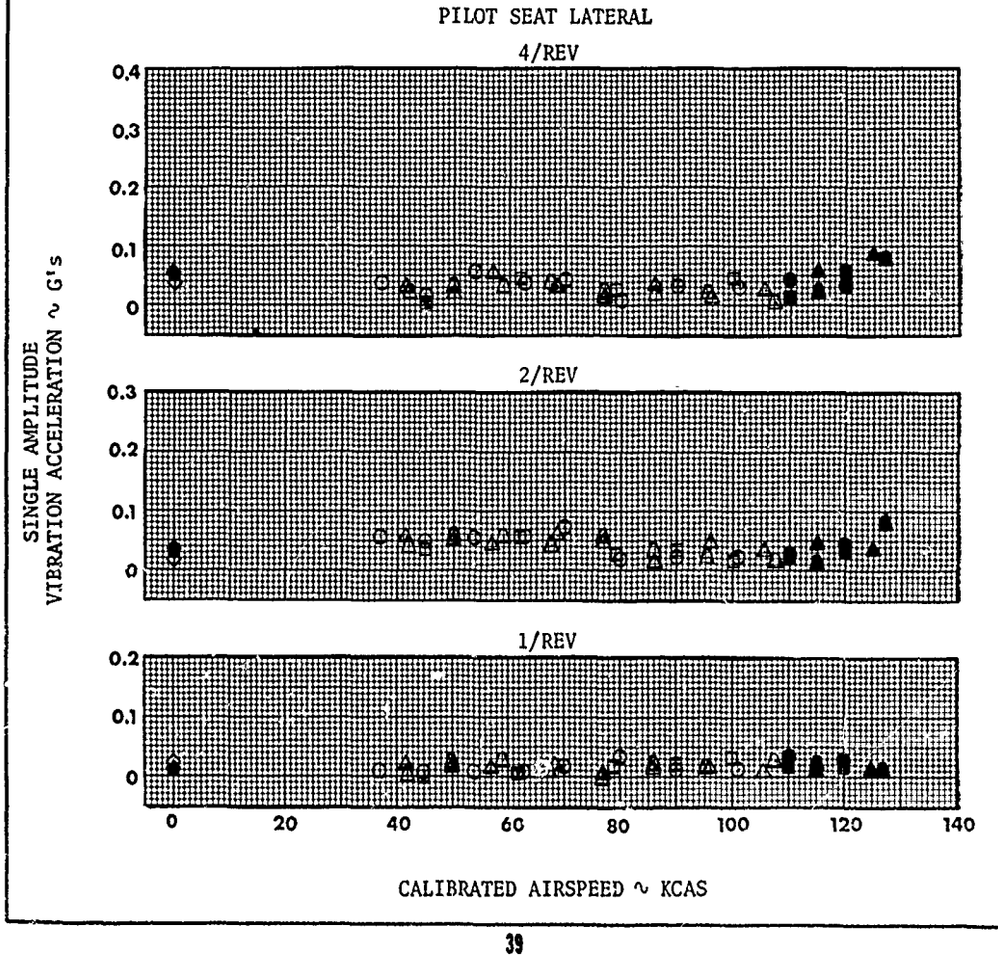


FIGURE 6 (CONTINUED)

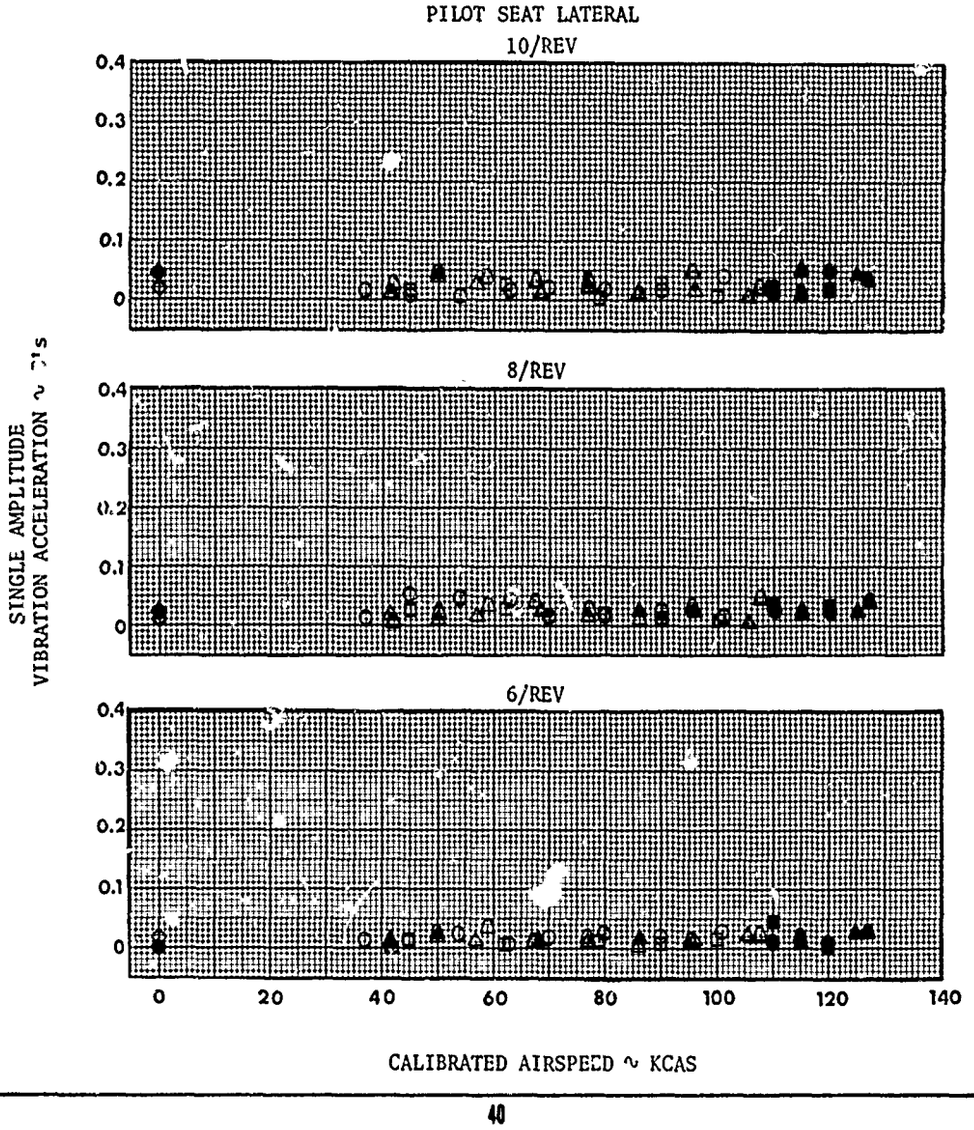


FIGURE 7

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

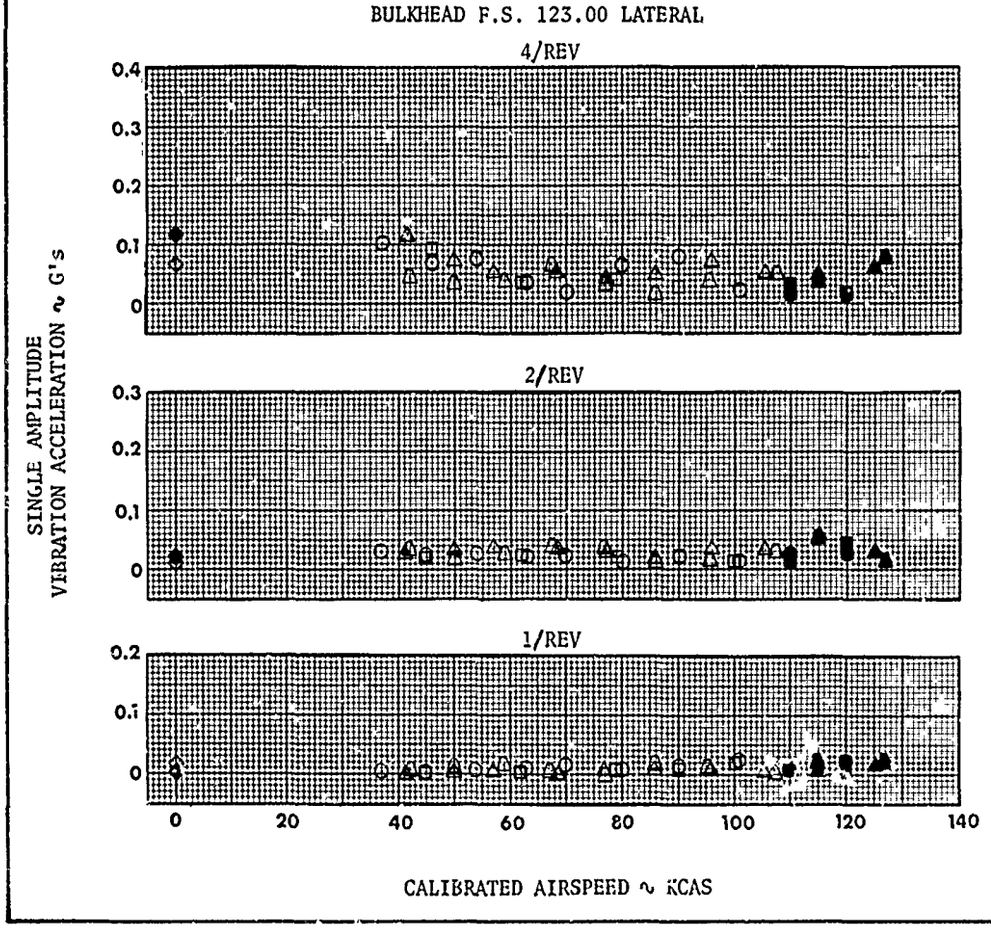


FIGURE 7 (CONTINUED)

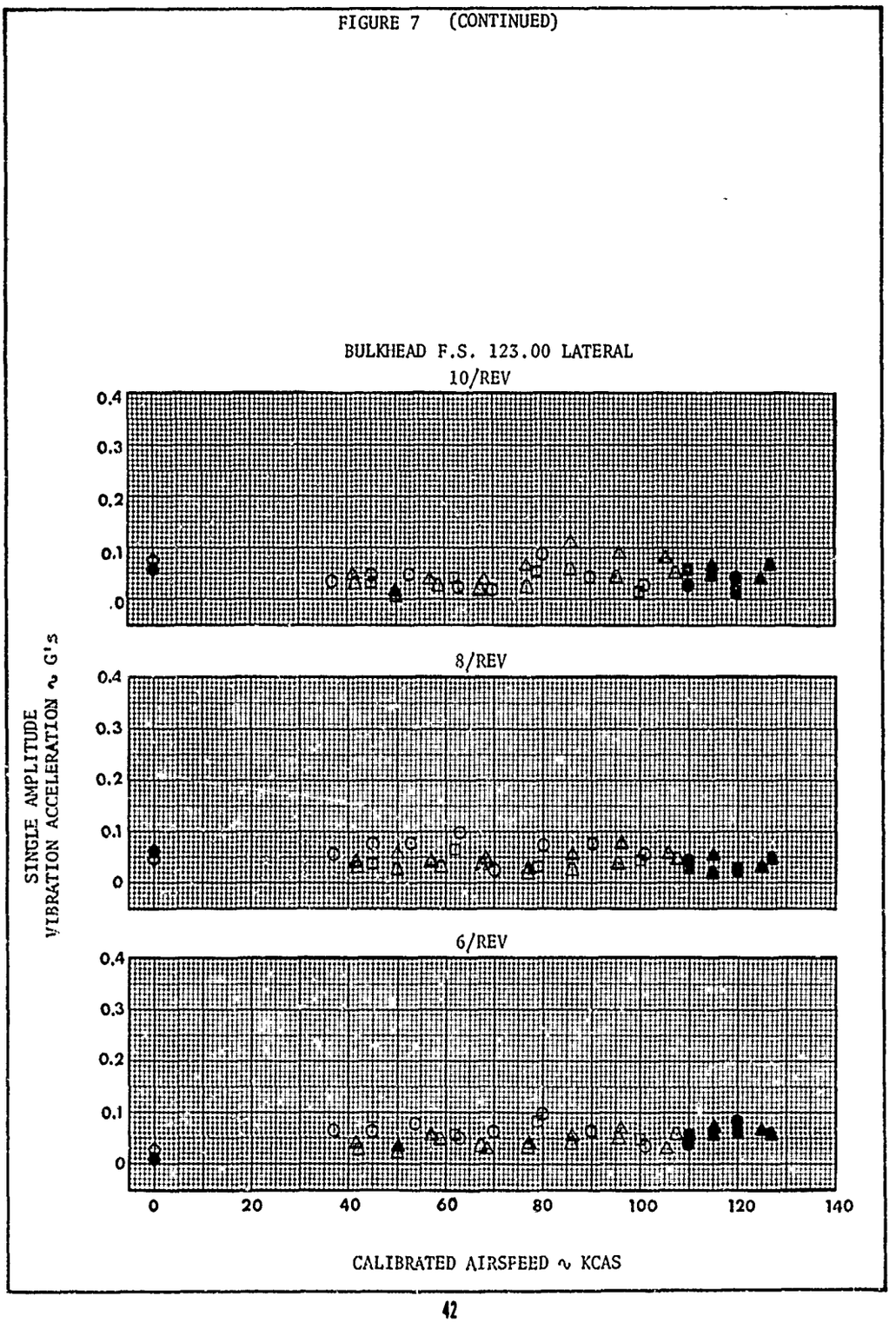


FIGURE 8

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

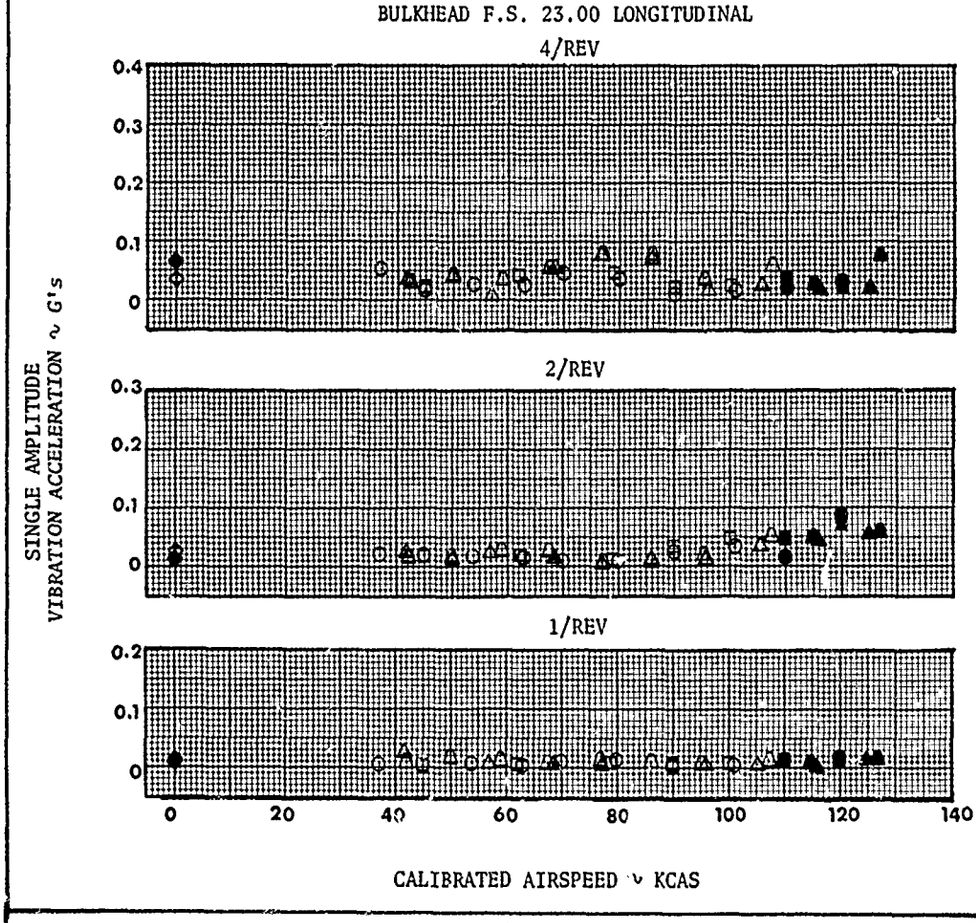


FIGURE 8 (CONTINUED)

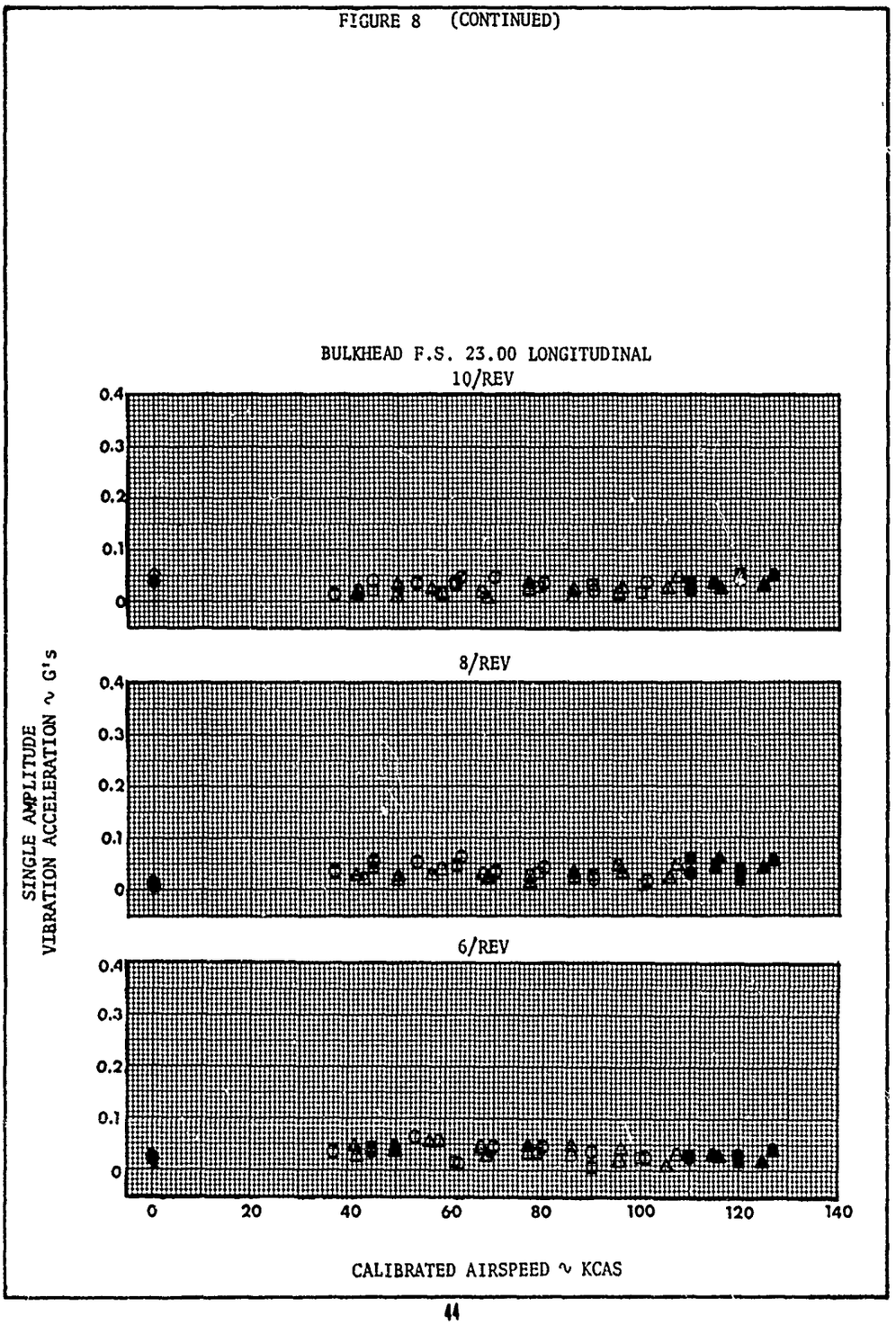


FIGURE 9

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9460	870	128.2	1.1 LT	323	REMOVED	HOVERING FLT
○	9250	2500	128.0	1.1 LT	322	REMOVED	LEVEL FLT
●	9150	2500	127.9	1.1 LT	320	REMOVED	DIVING FLT
□	9060	2500	127.8	1.1 LT	320	REMOVED	LEVEL FLT
■	8970	2500	127.7	1.2 LT	320	REMOVED	DIVING FLT
◆	9540	960	126.8	0.5 LT	324	INSTALL	HOVERING FLT
△	9280	2440	126.5	0.5 LT	322	INSTALL	LEVEL FLT
▲	9210	2400	126.4	0.5 LT	318	INSTALL	DIVING FLT
△	9060	2500	126.3	0.5 LT	322	INSTALL	LEVEL FLT
▲	8950	2500	126.2	0.6 LT	320	INSTALL	DIVING FLT

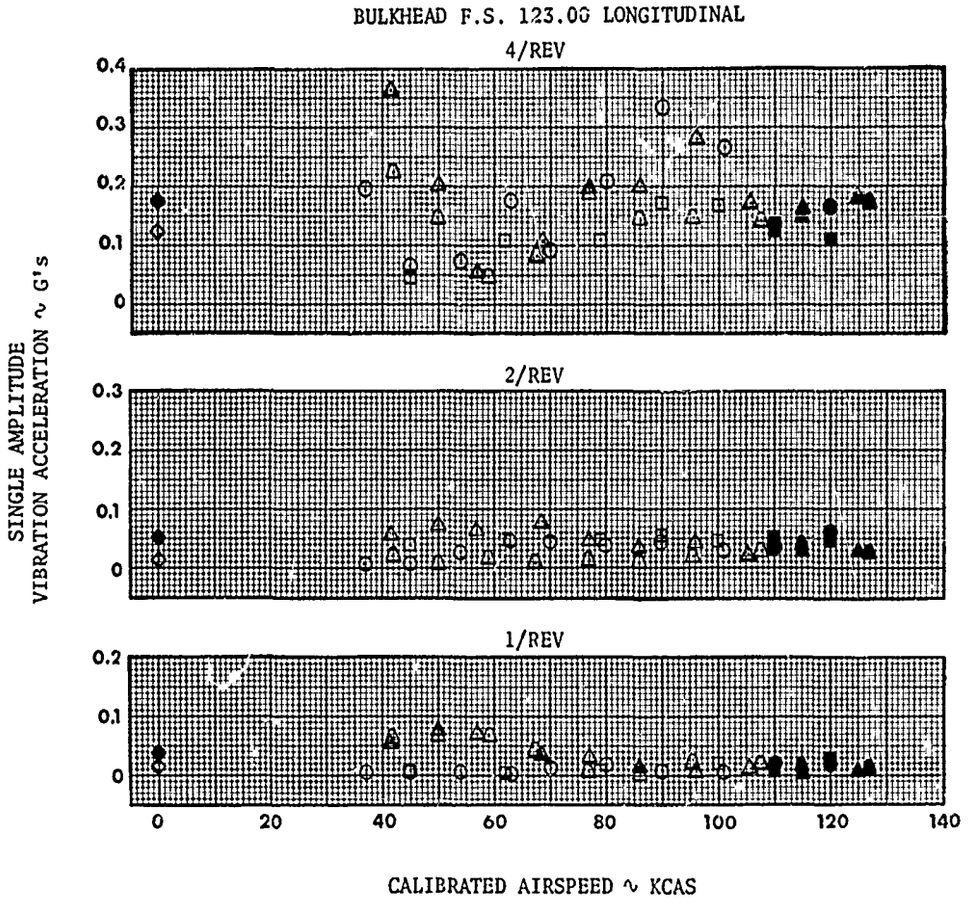


FIGURE 9 (CONTINUED)

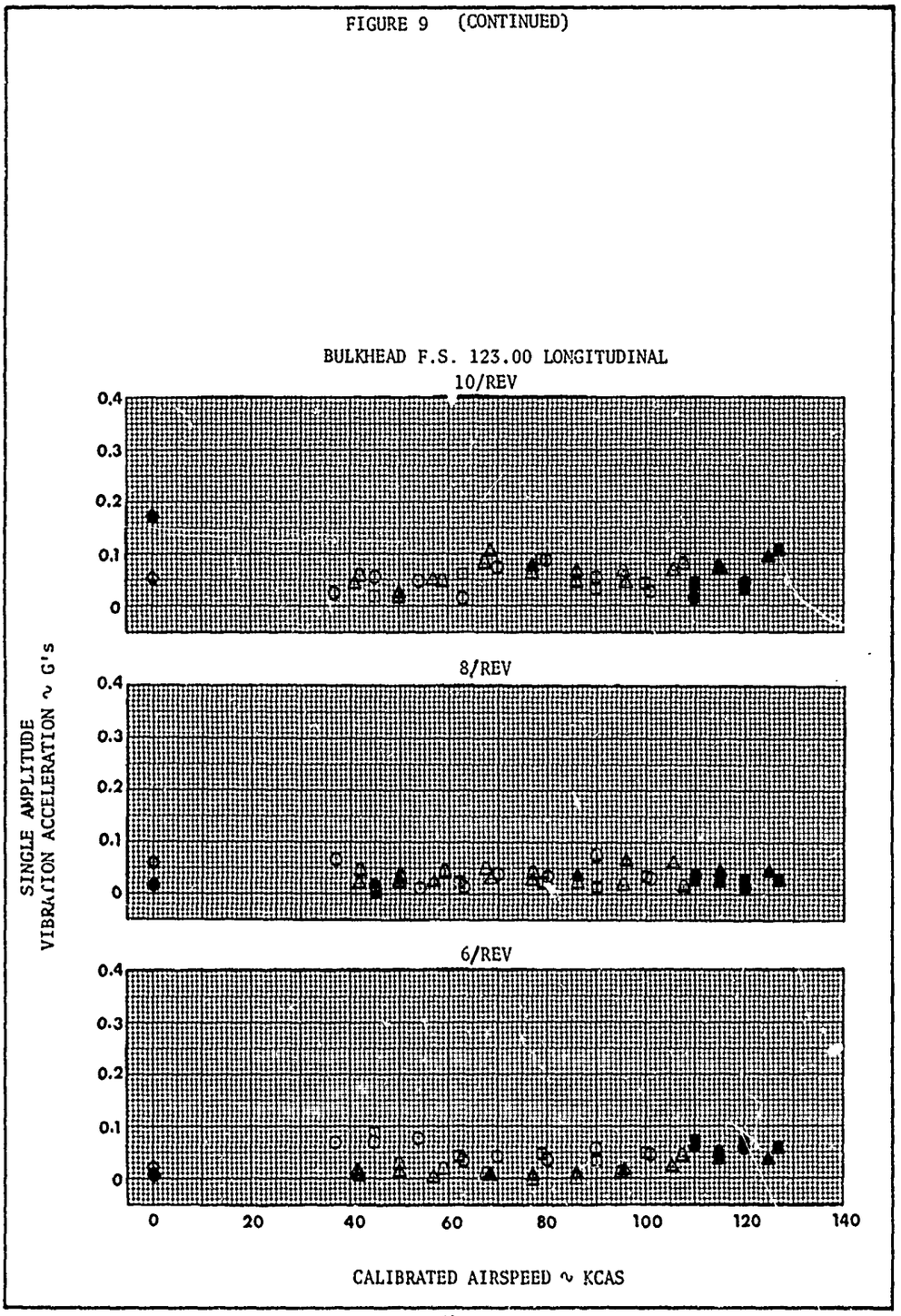


FIGURE 10
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

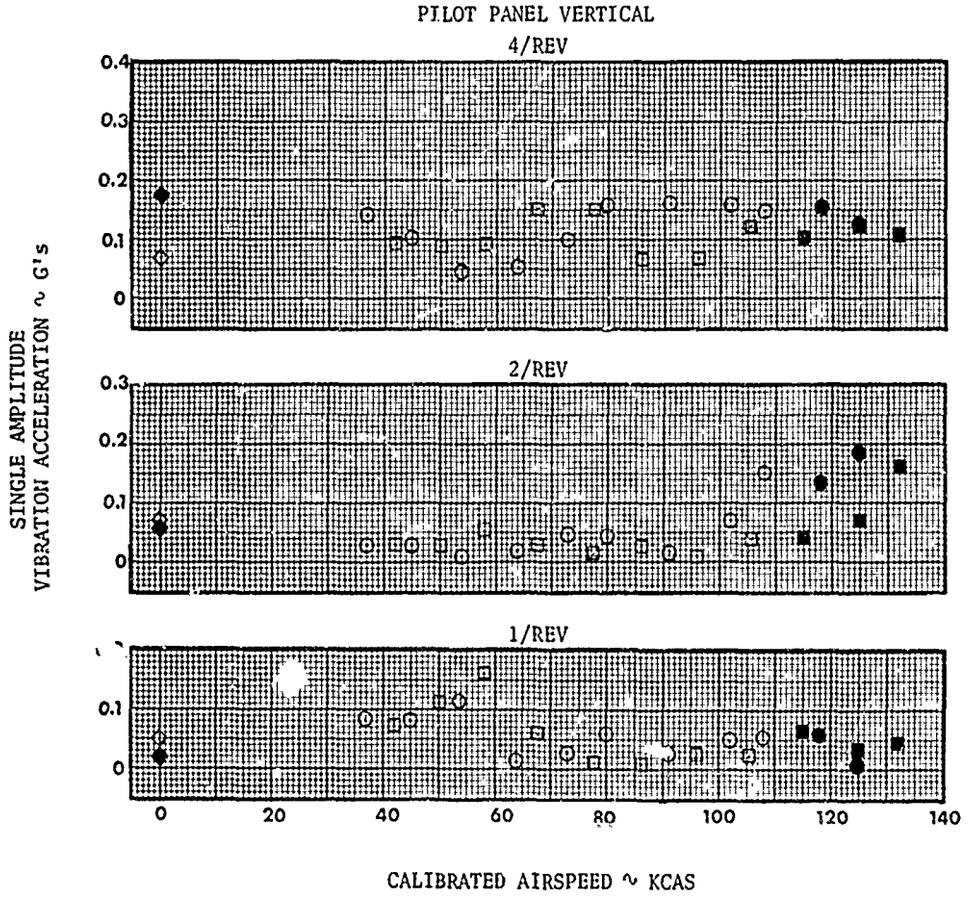


FIGURE 10 (CONTINUED)

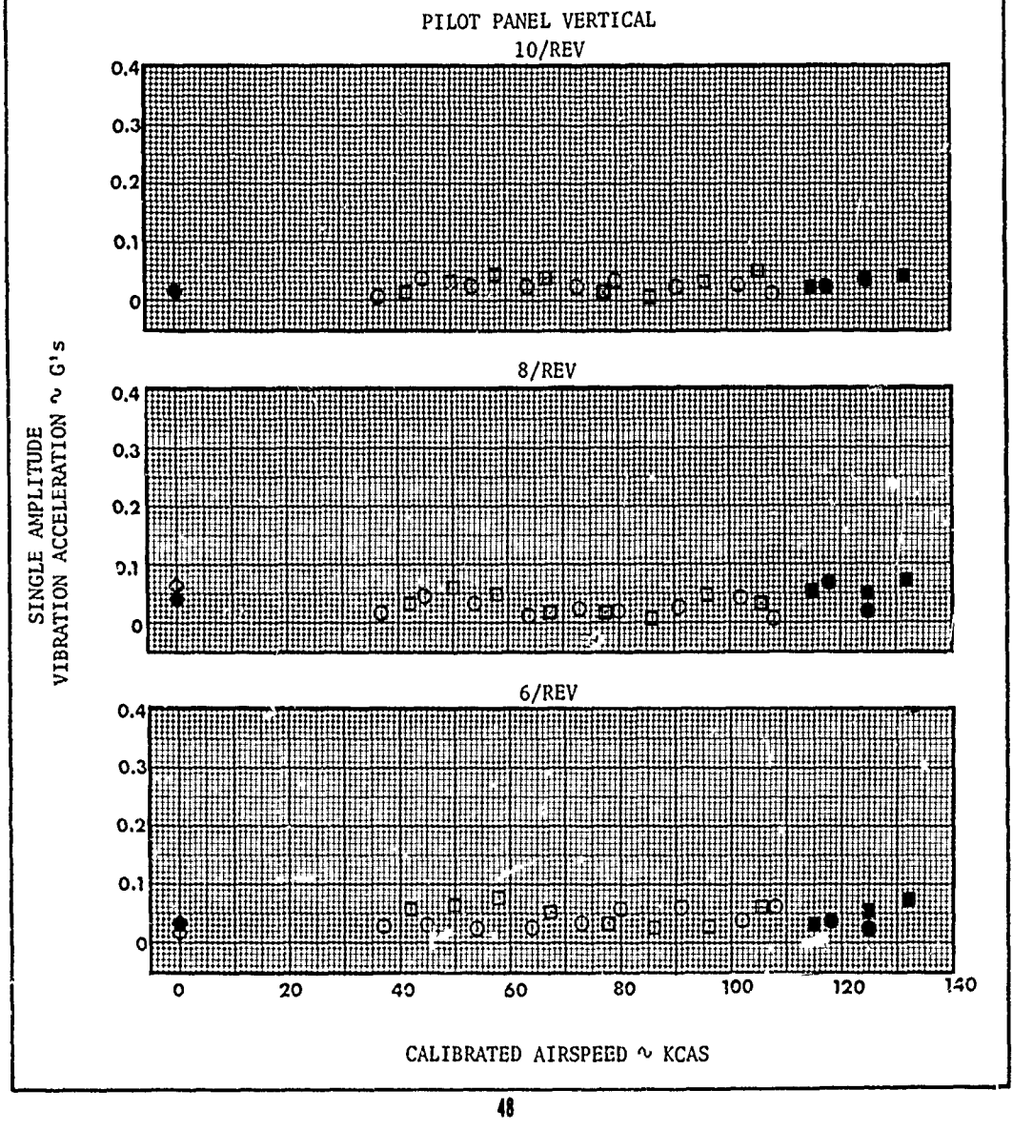


FIGURE 11

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

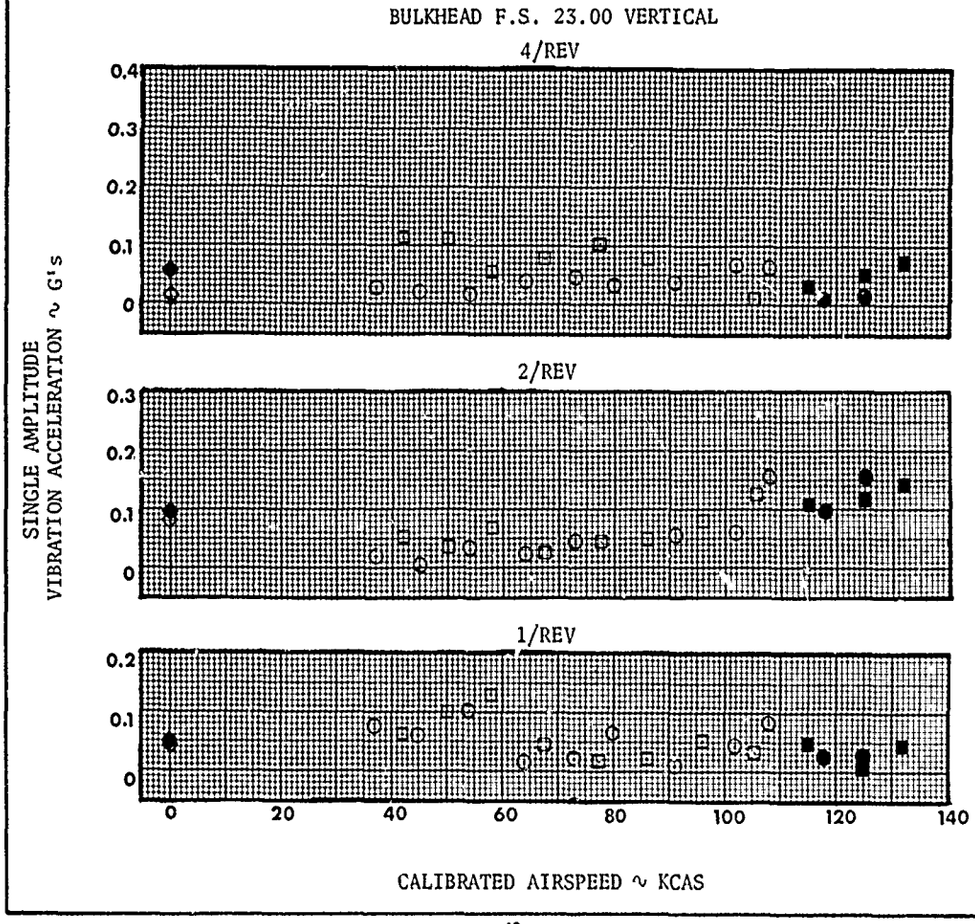


FIGURE 11 (CONTINUED)

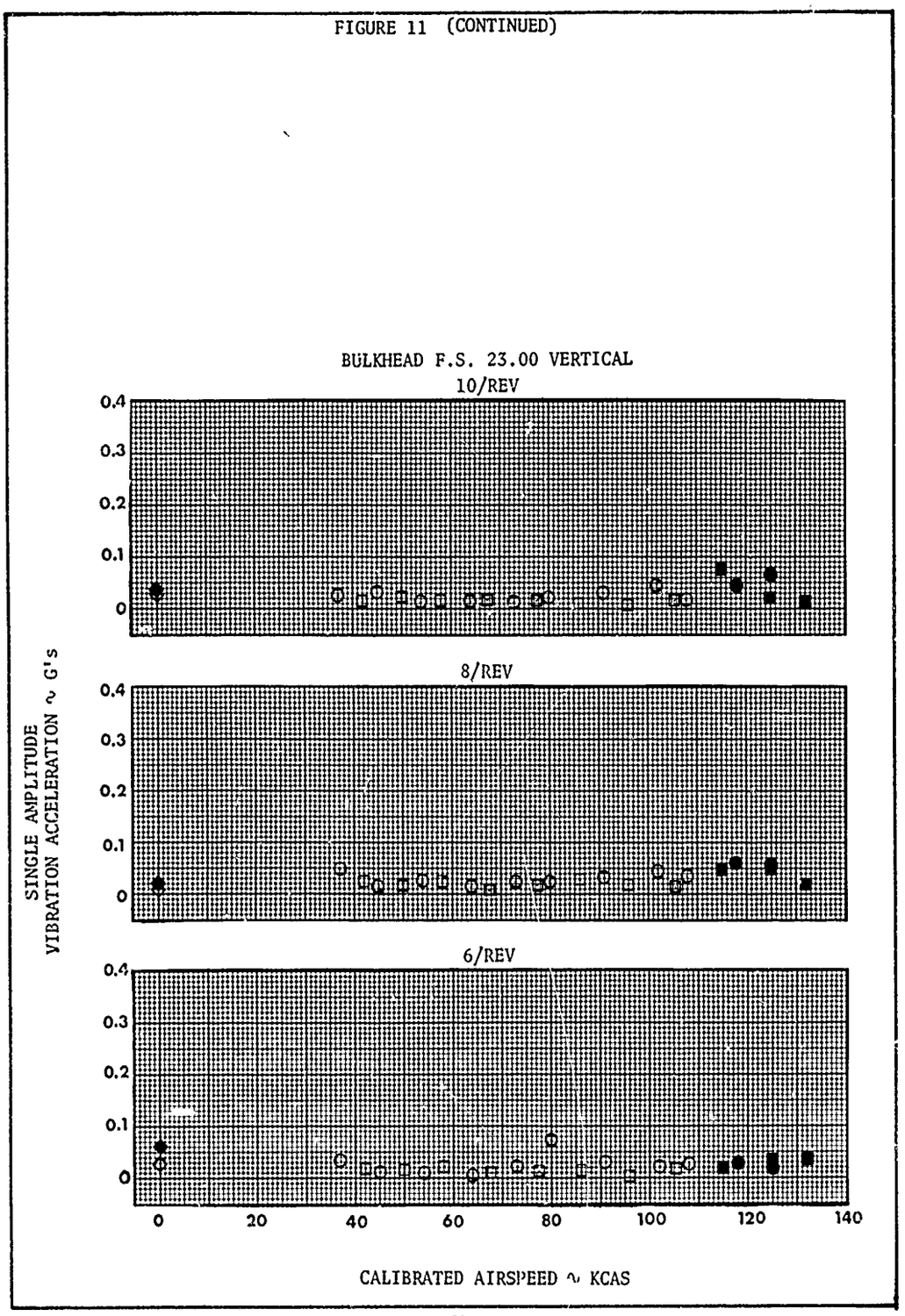


FIGURE 12

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

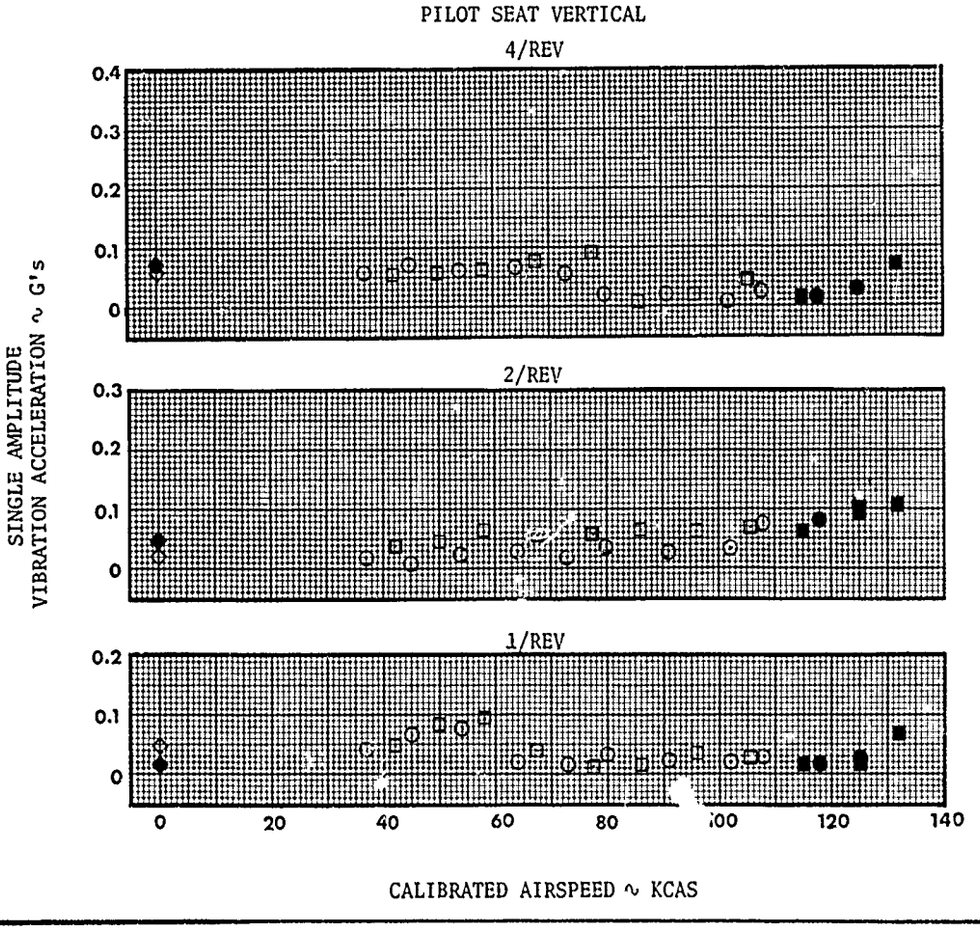


FIGURE 12 (CONTINUED)

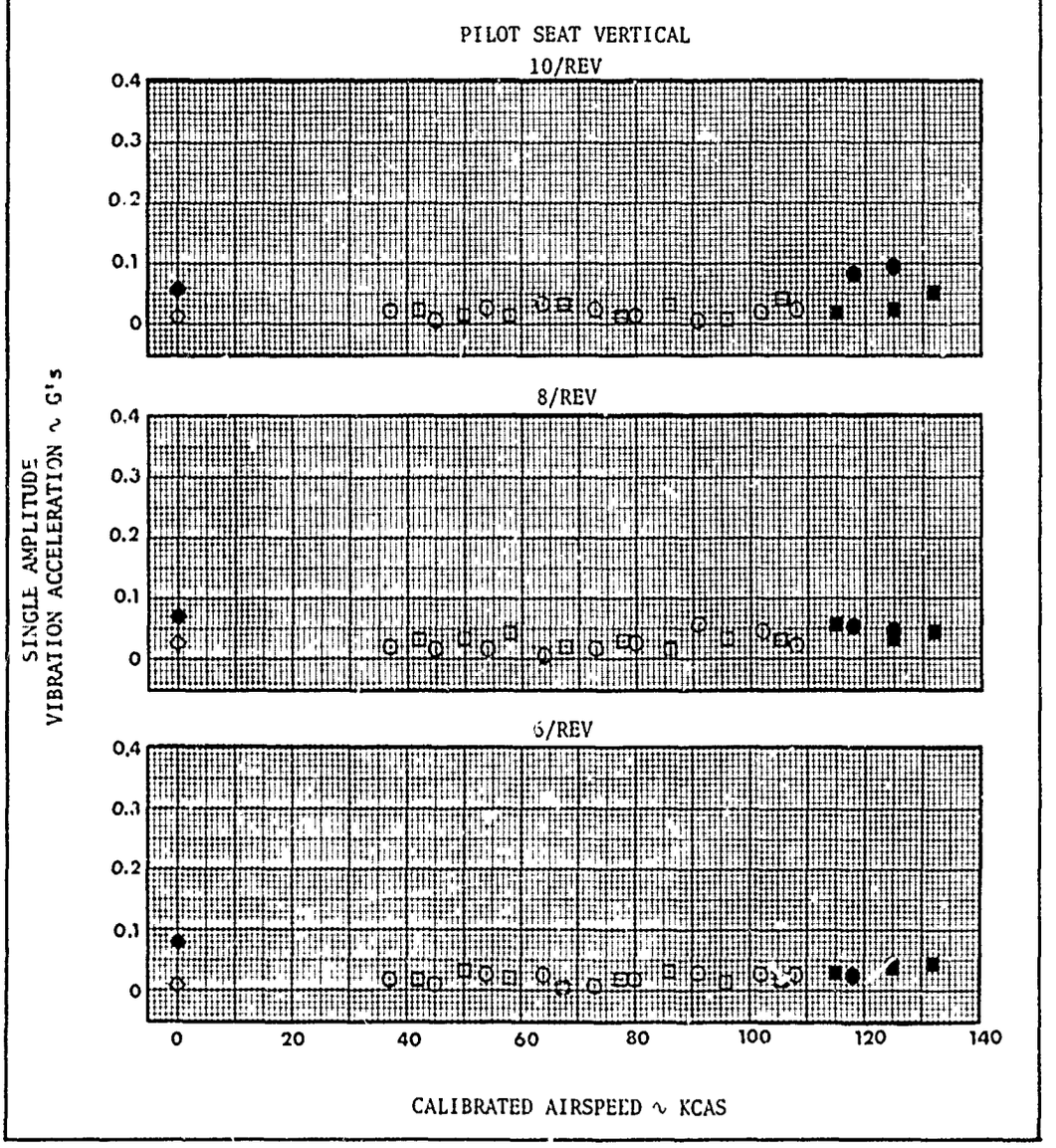


FIGURE 13

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
◧	8420	2500	125.6	0.6 LT	322	INSTALL	DIVING FLT

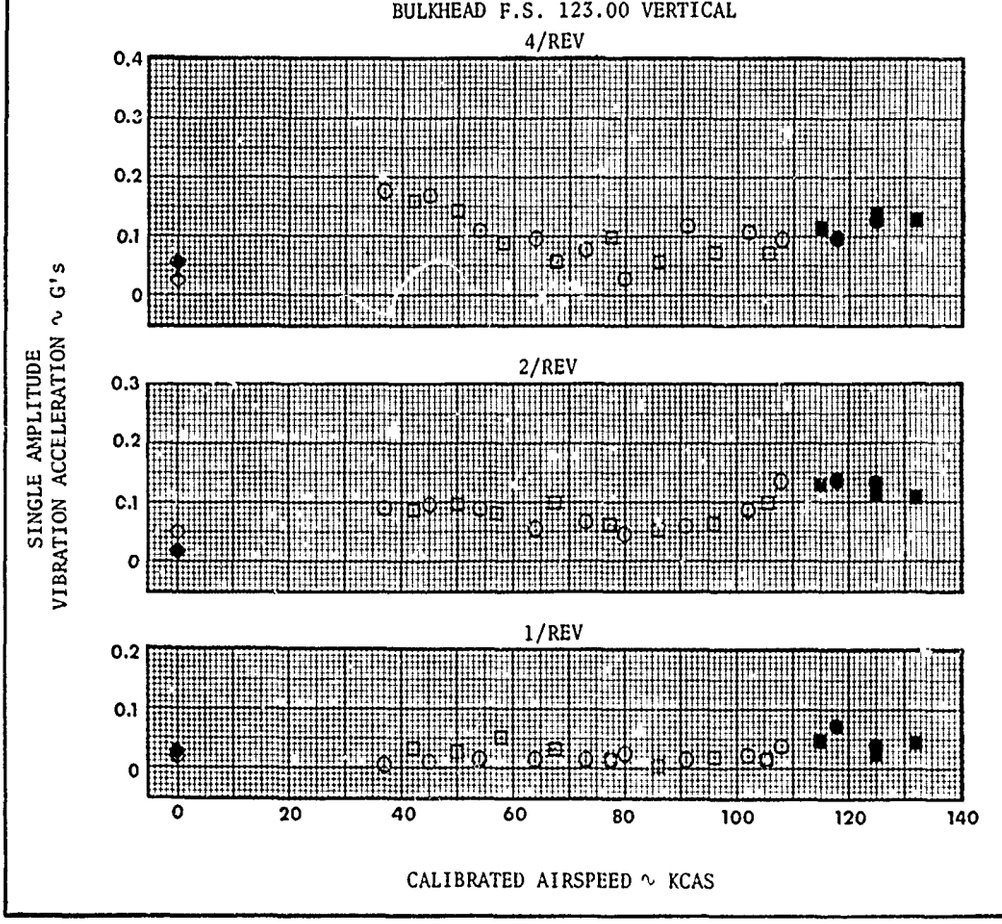


FIGURE 13 (CONTINUED)

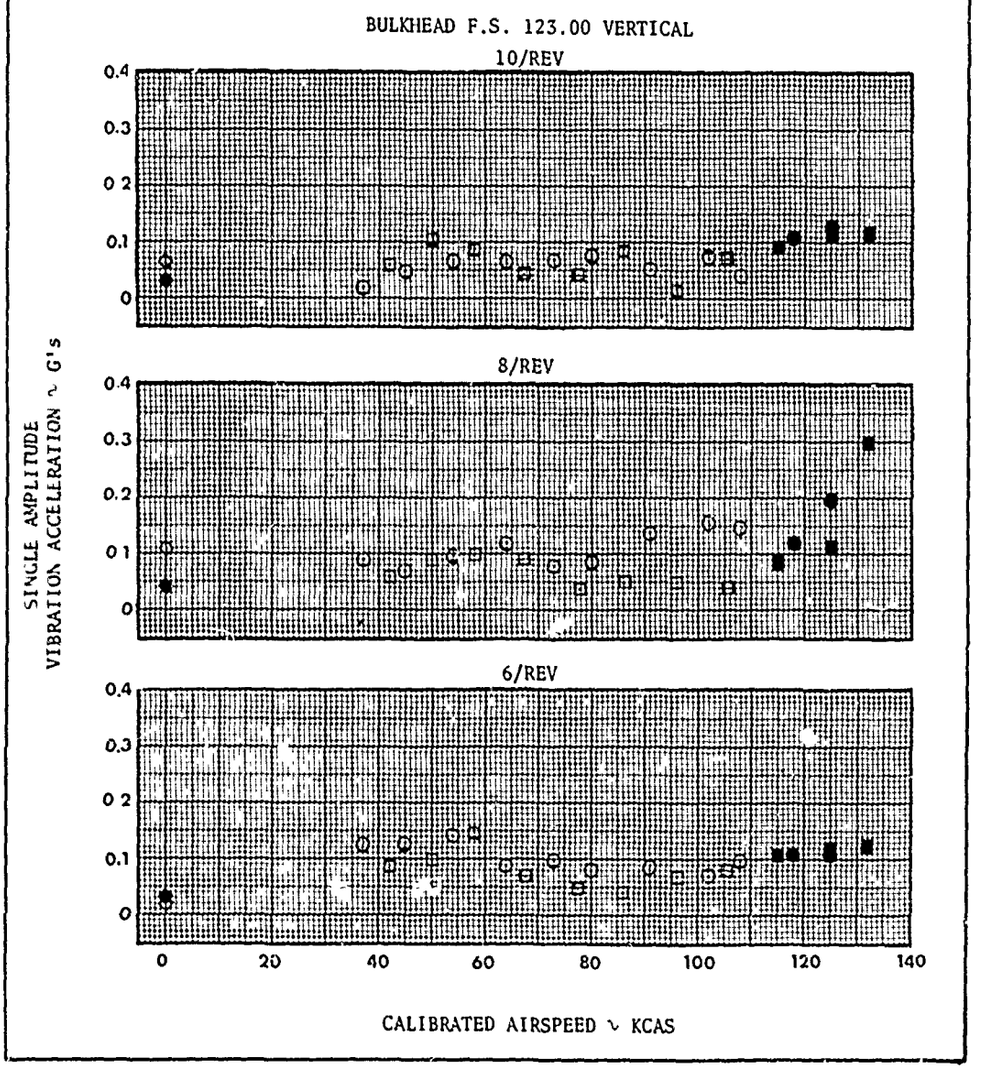


FIGURE 14

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

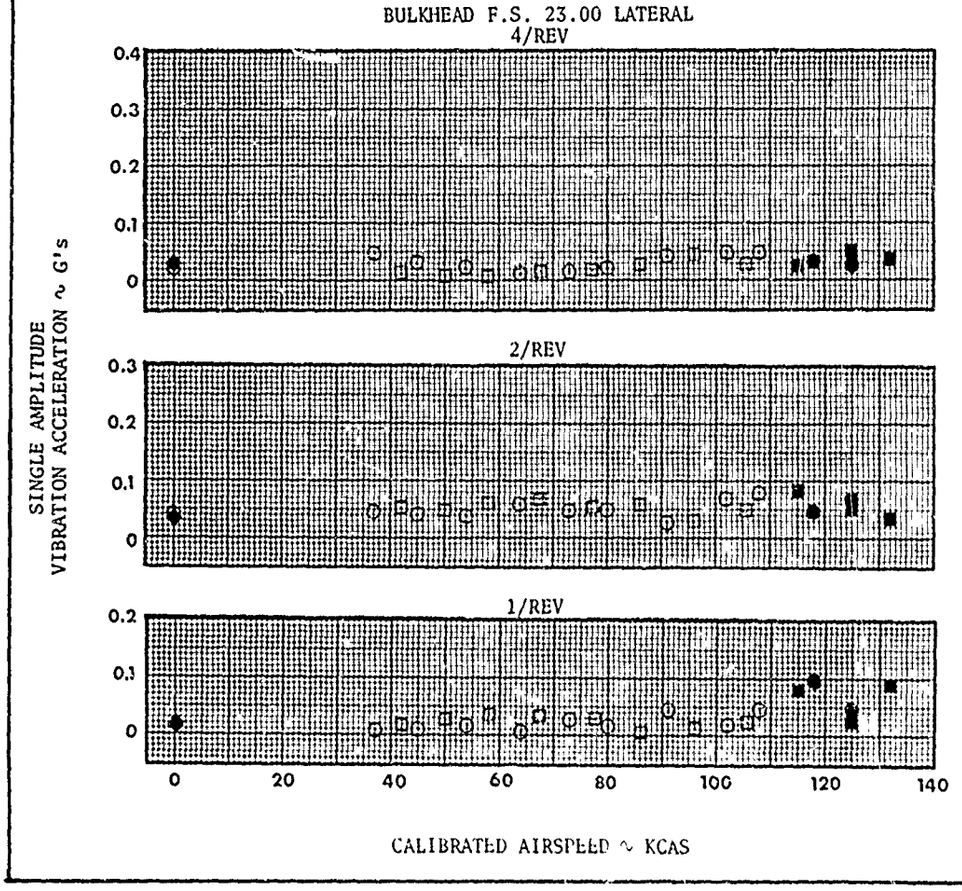


FIGURE 14 (CONTINUED)

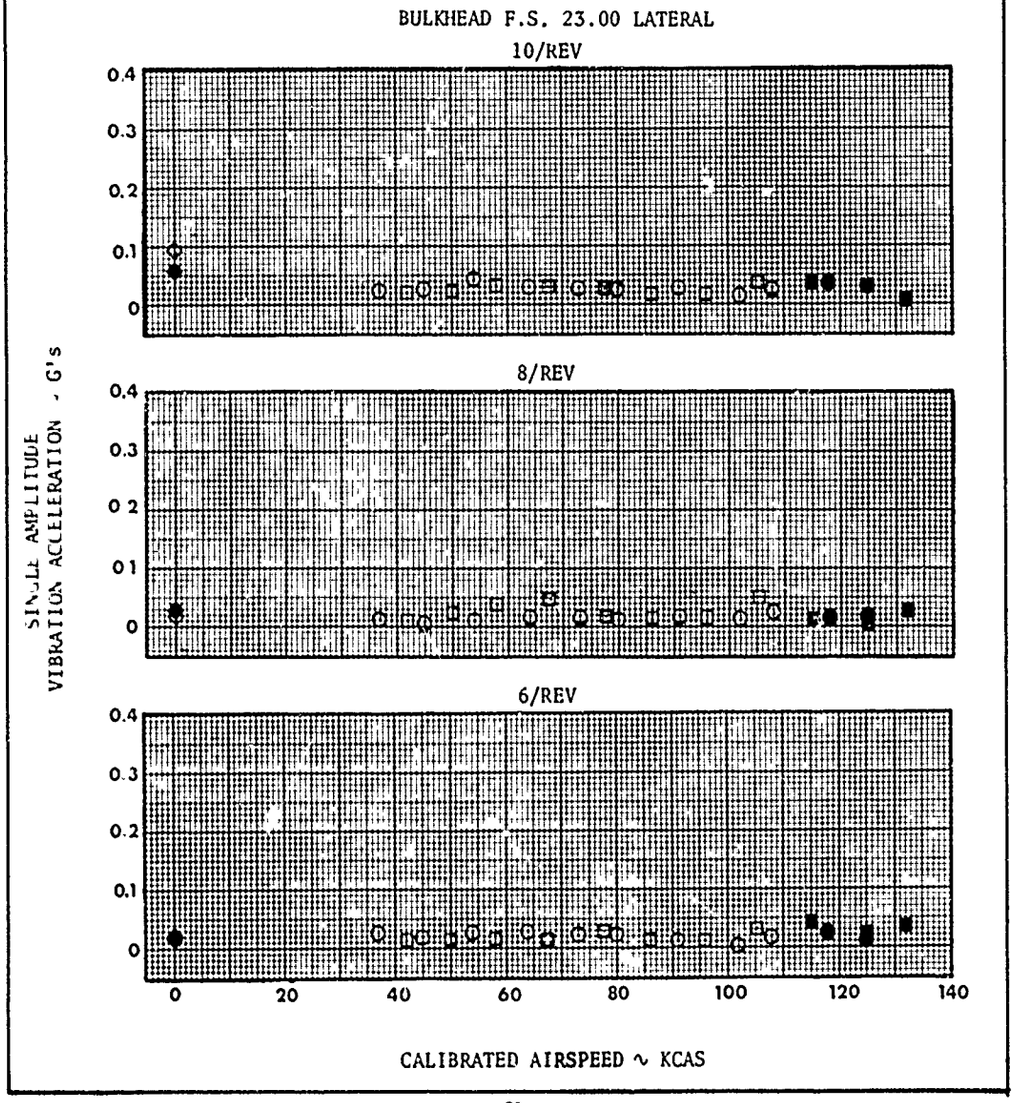


FIGURE 15

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

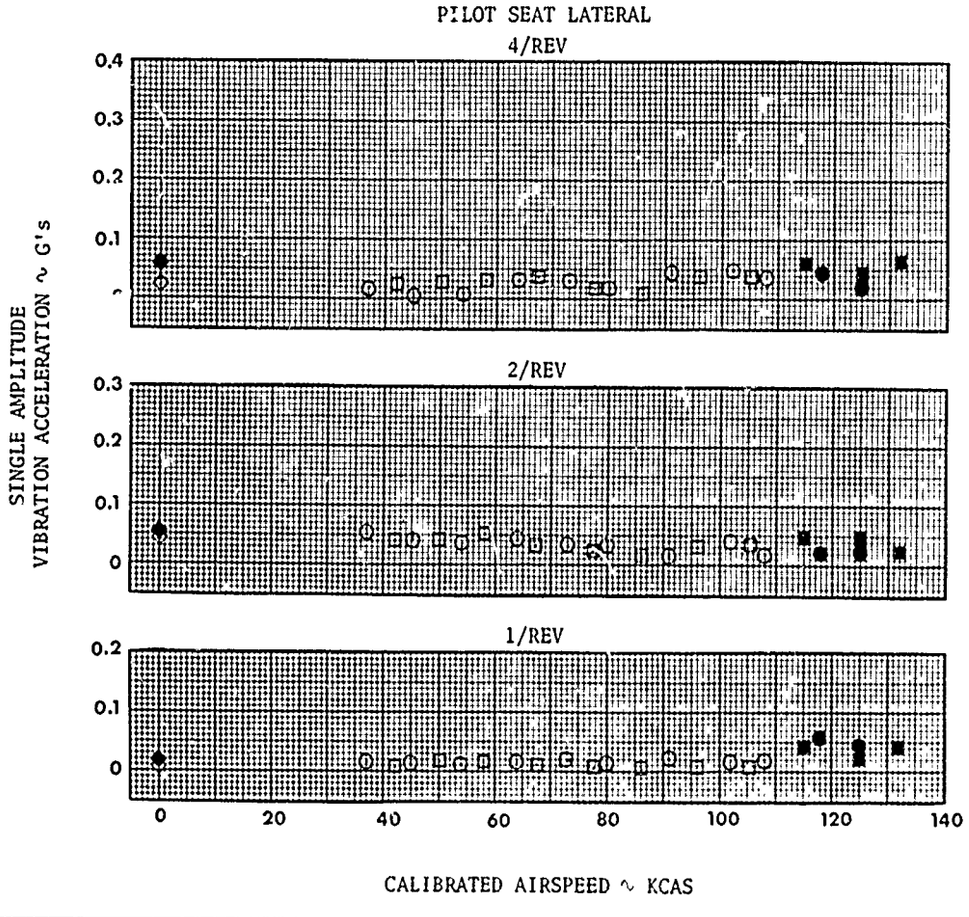


FIGURE 15 (CONTINUED)

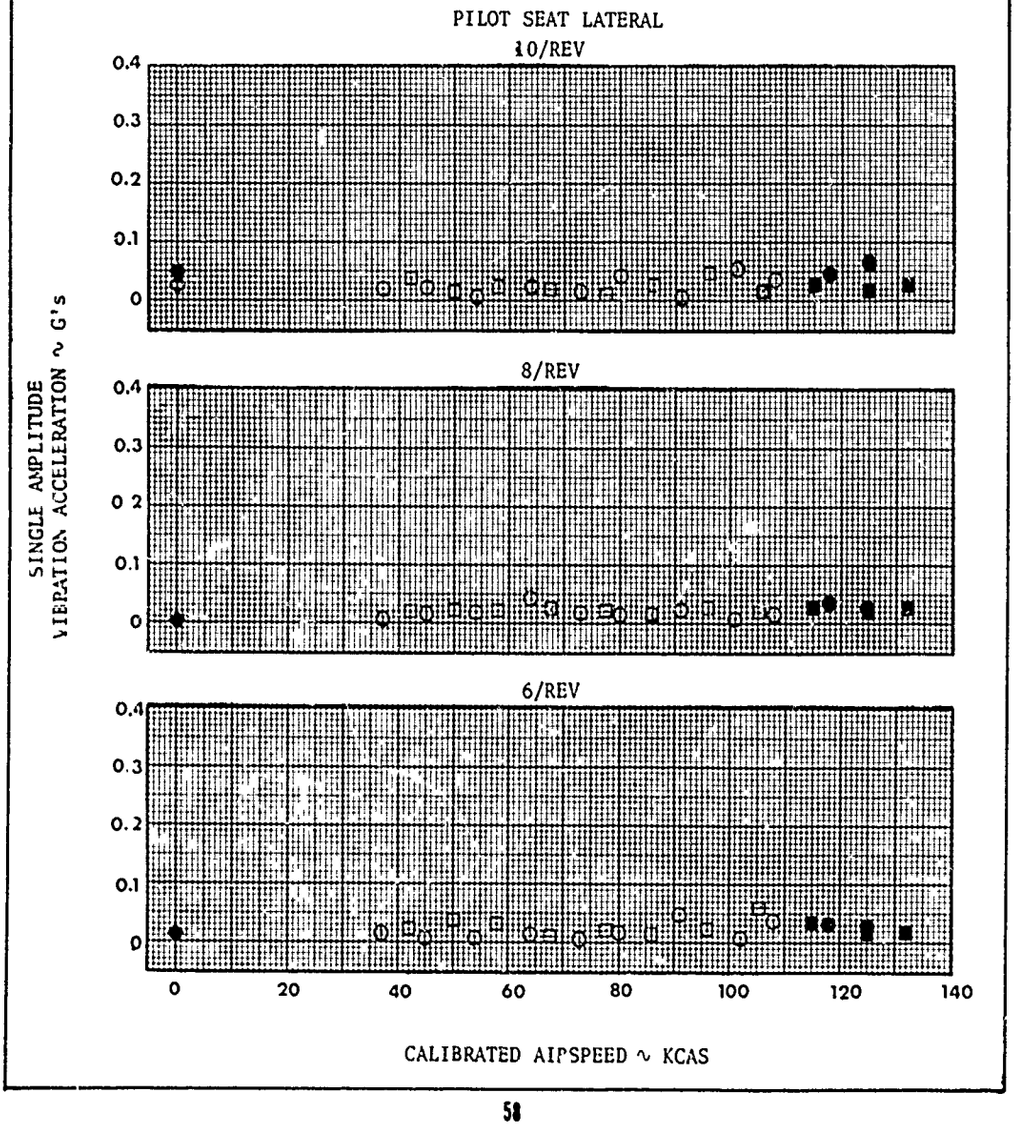


FIGURE 16

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
⊠	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

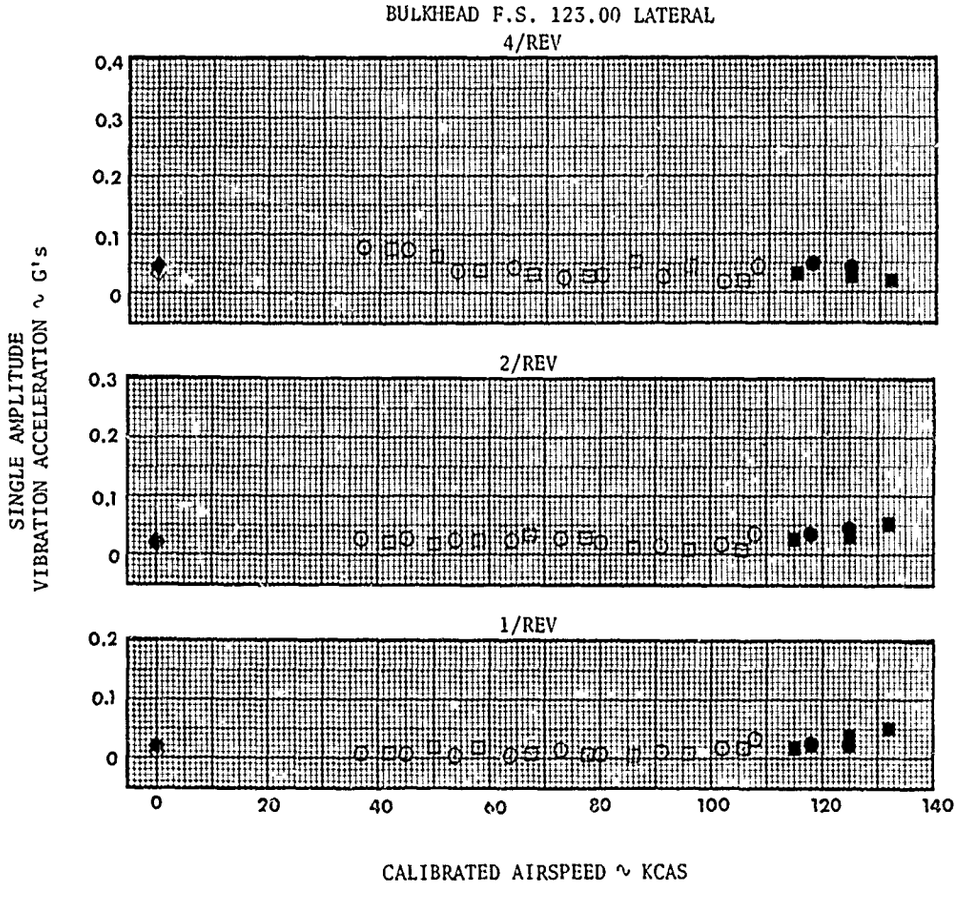


FIGURE 16 (CONTINUED)

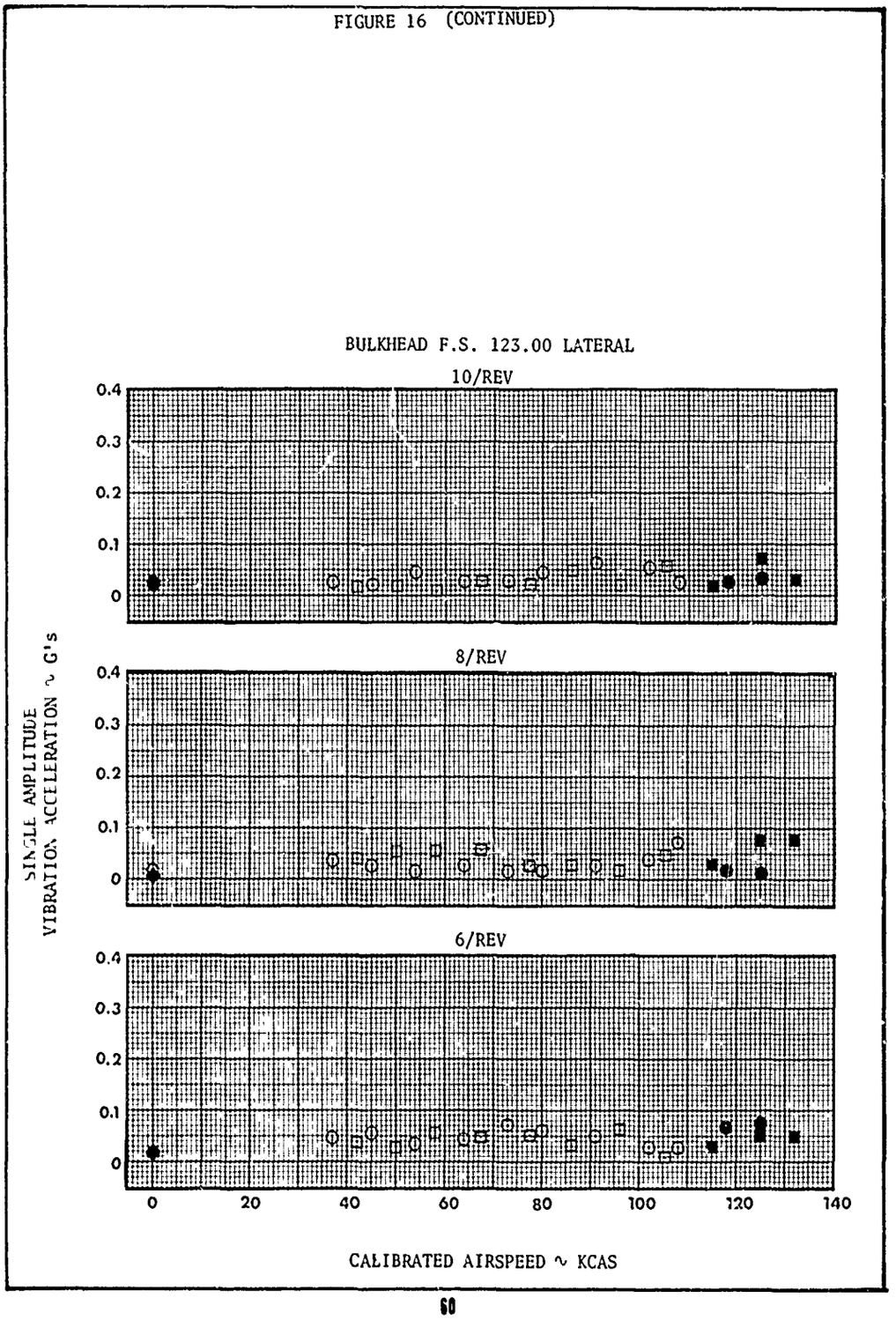


FIGURE 17

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

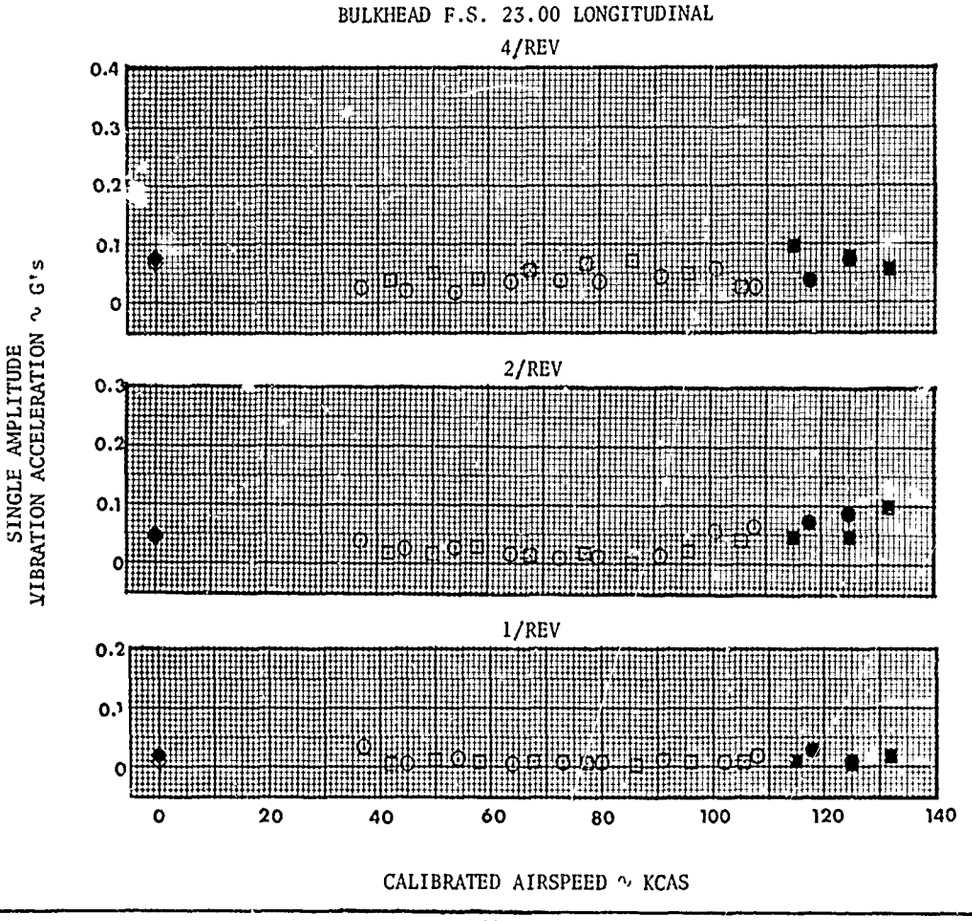


FIGURE 17 (CONTINUED)

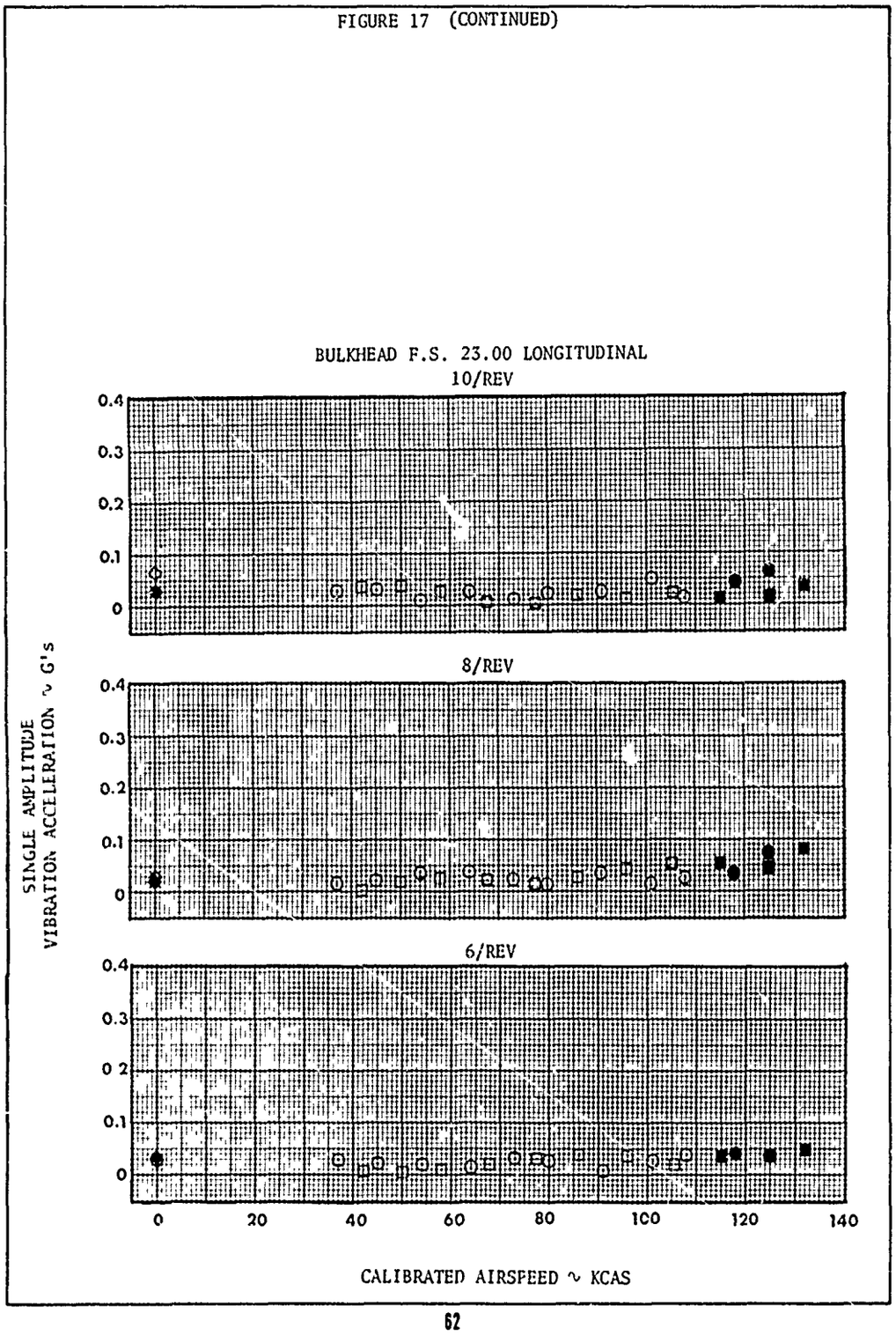


FIGURE 18

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8340	930	127.1	1.2 LT	327	REMOVED	HOVERING FLT
○	8550	2600	127.3	1.2 LT	322	REMOVED	LEVEL FLT
●	8490	2600	127.2	1.2 LT	320	REMOVED	DIVING FLT
◆	8340	1190	125.5	0.6 LT	322	INSTALL	HOVERING FLT
□	8510	2500	125.7	0.6 LT	320	INSTALL	LEVEL FLT
■	8420	2600	125.6	0.6 LT	322	INSTALL	DIVING FLT

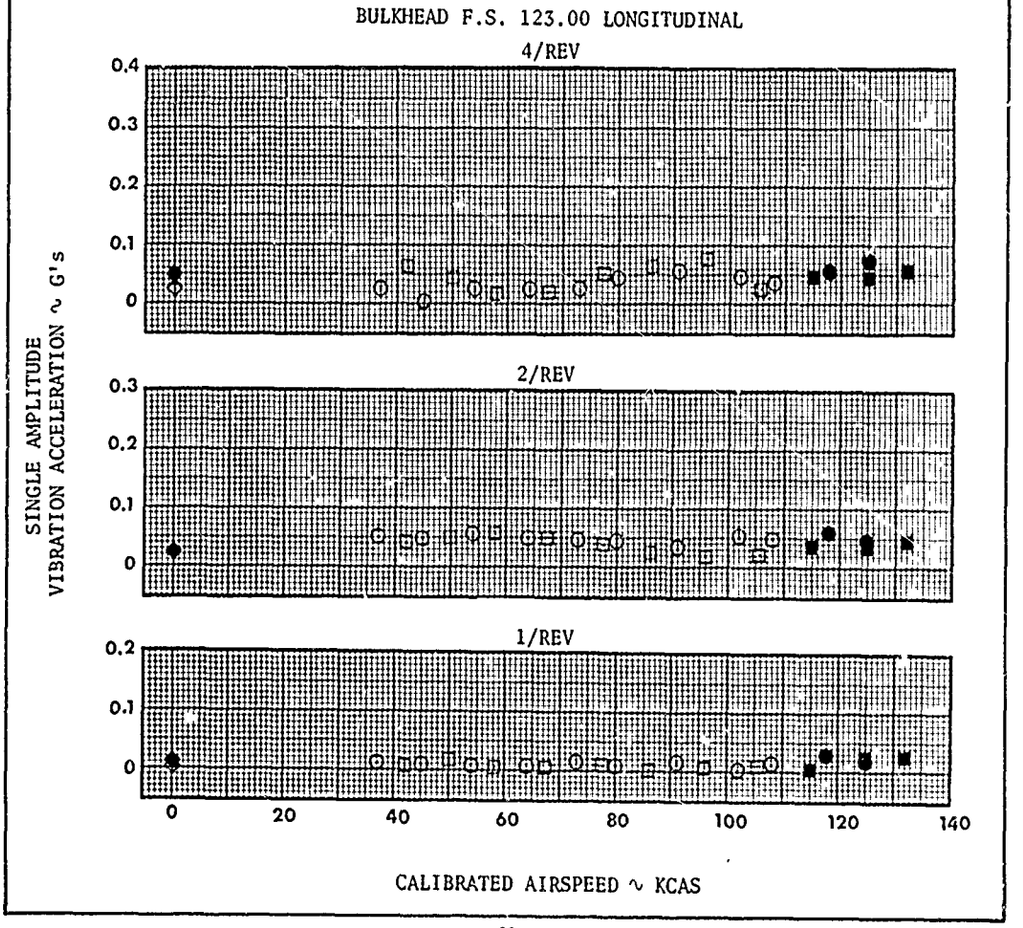


FIGURE 18 (CONTINUED)

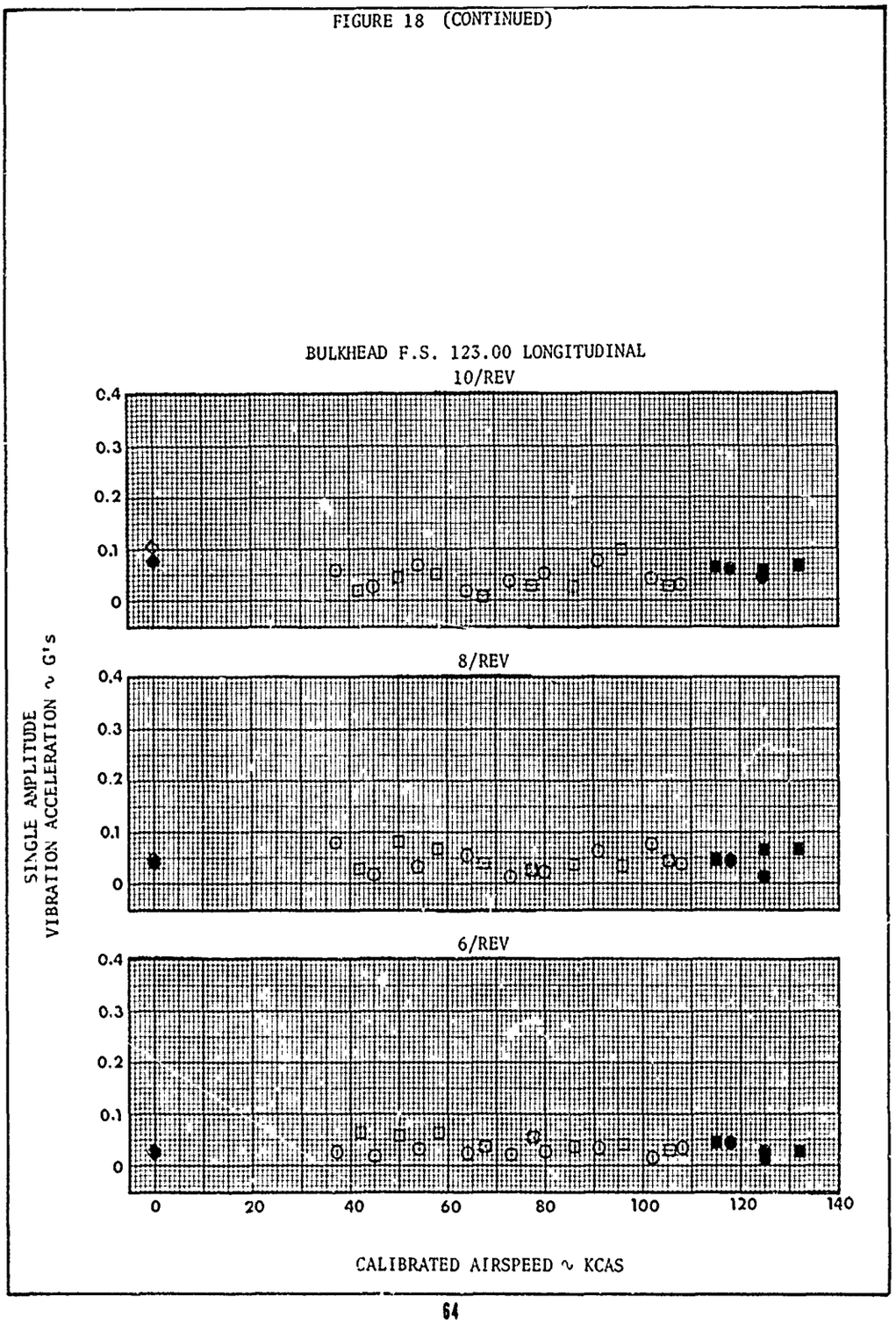


FIGURE 19

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▱	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

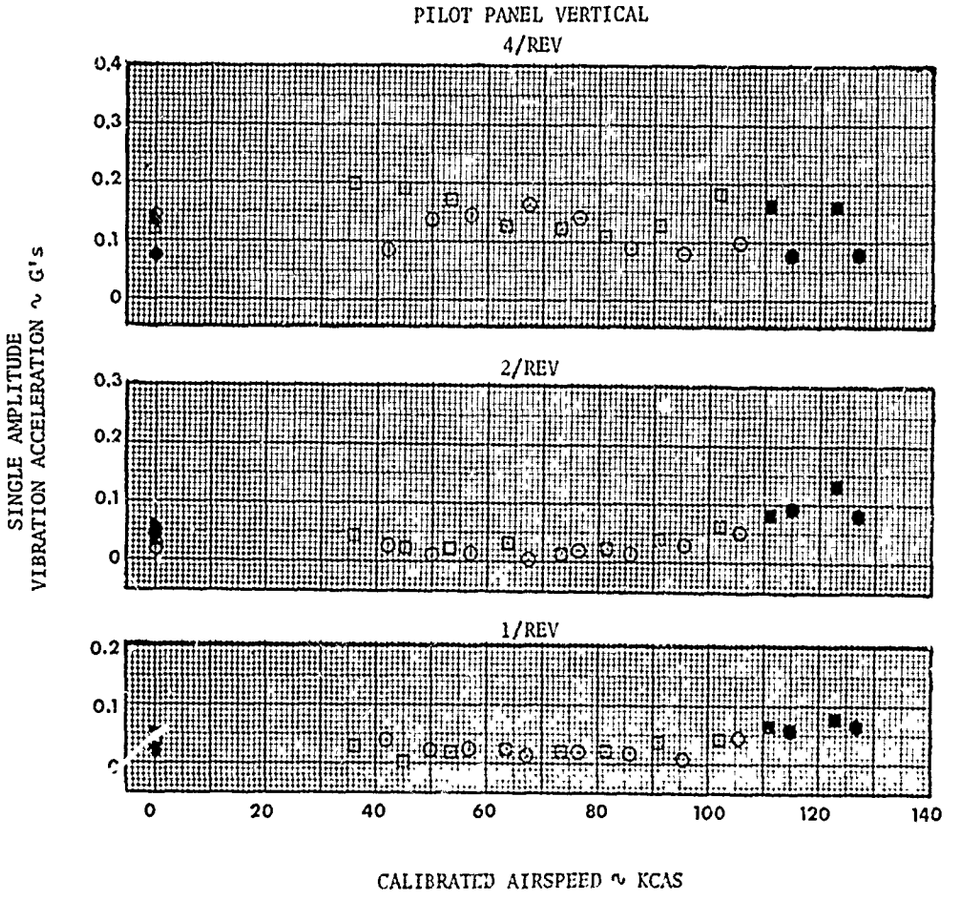


FIGURE 19 (CONTINUED)

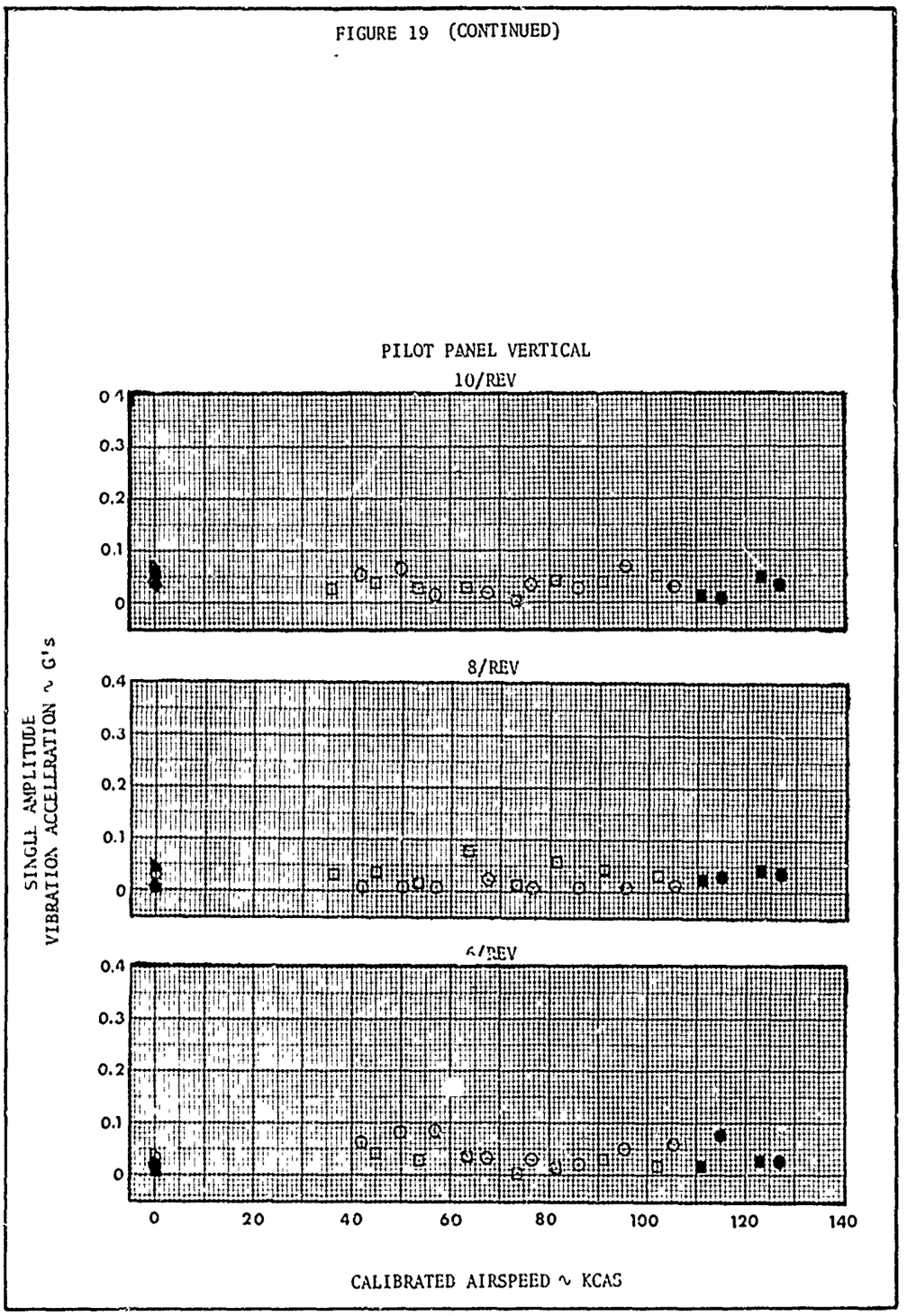


FIGURE 20
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

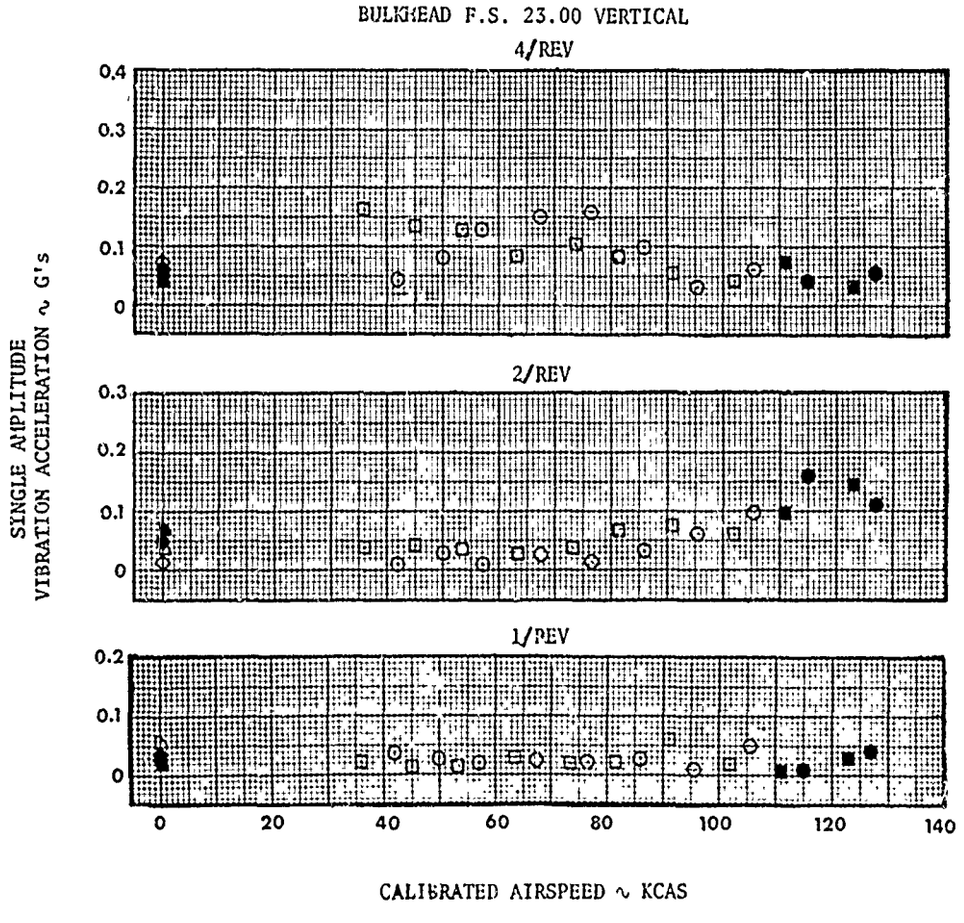


FIGURE 20 (CONTINUED)

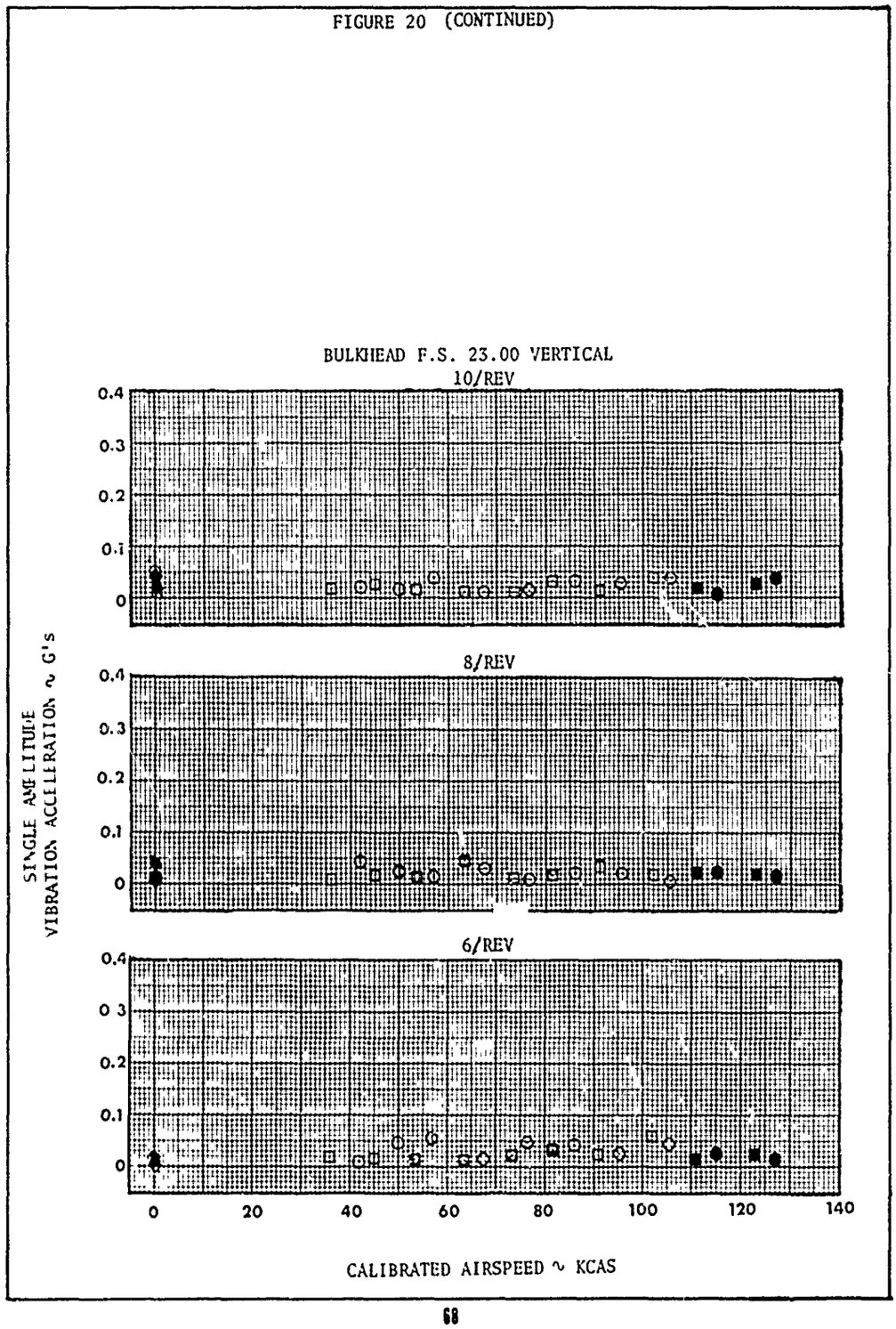


FIGURE 21

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

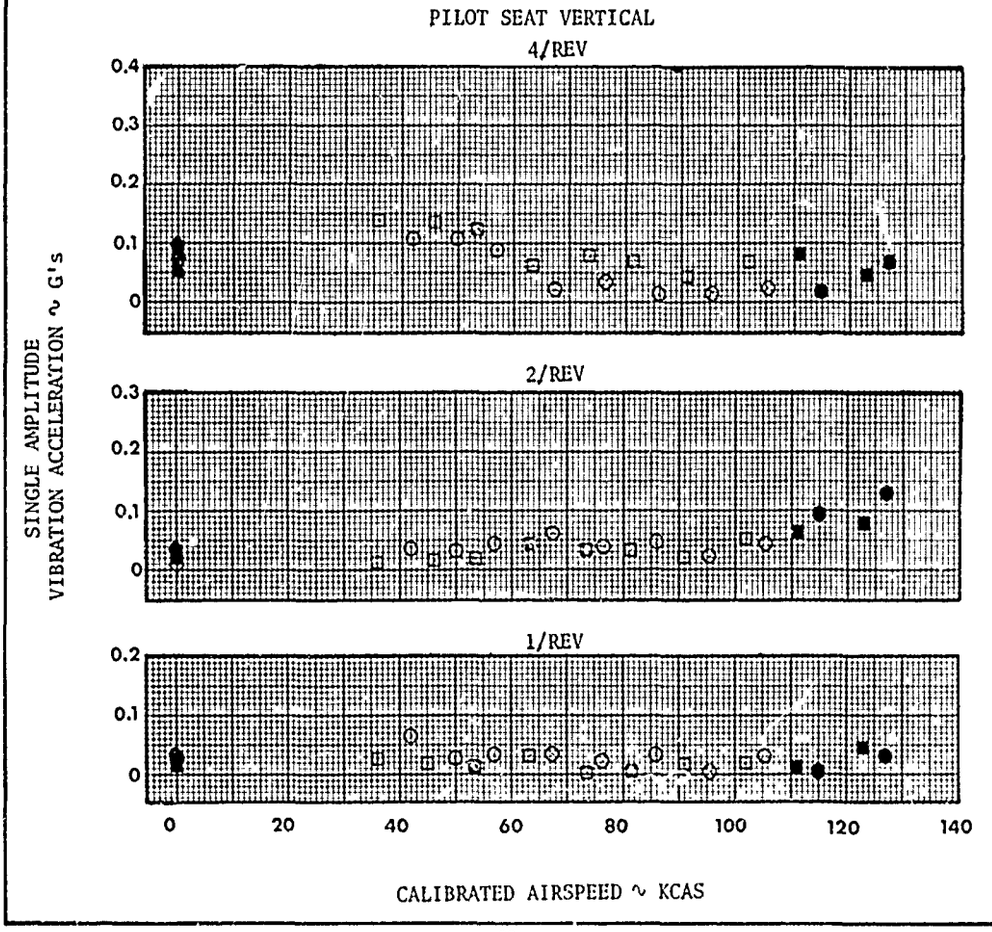


FIGURE 21 (CONTINUED)

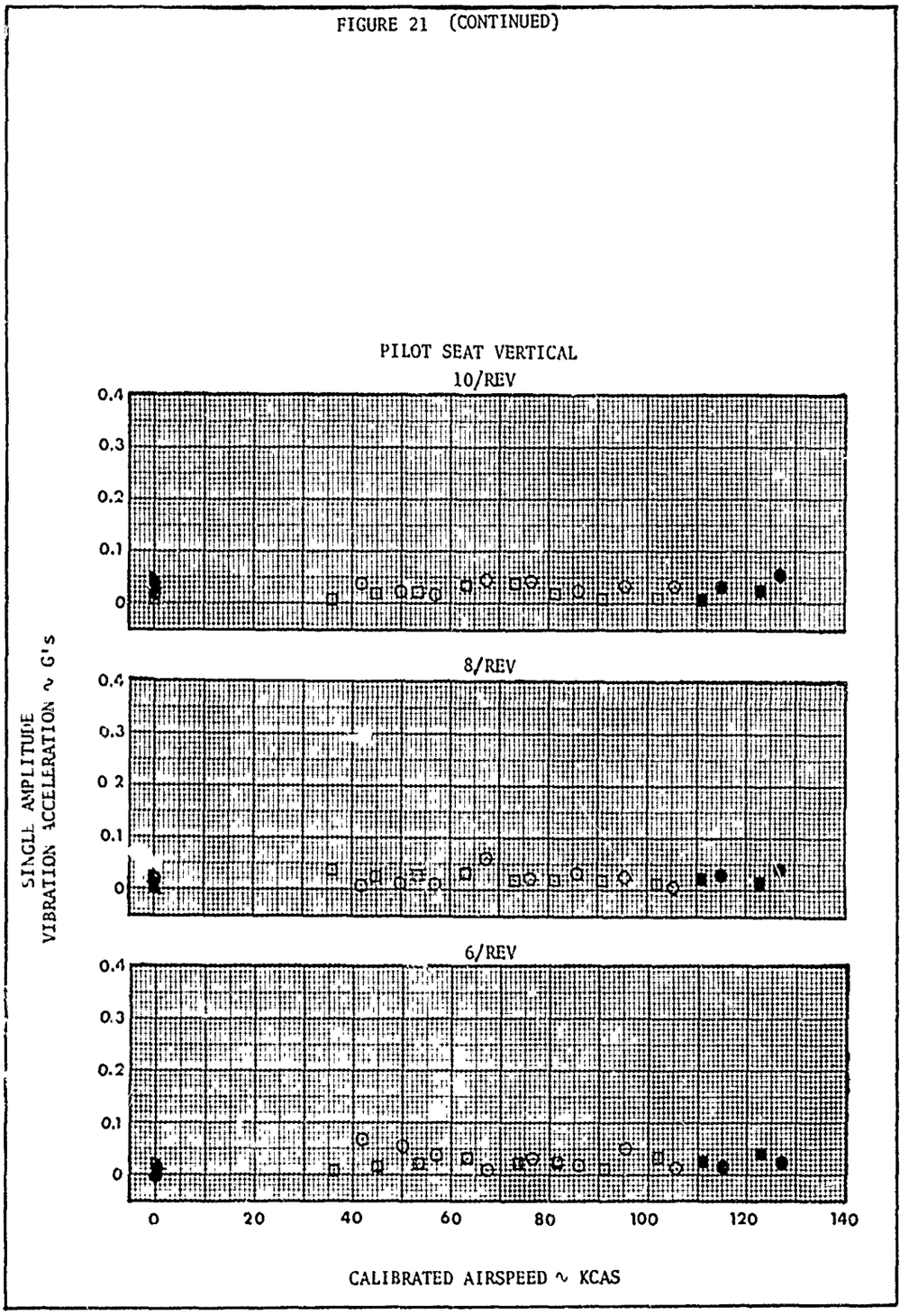


FIGURE 22

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

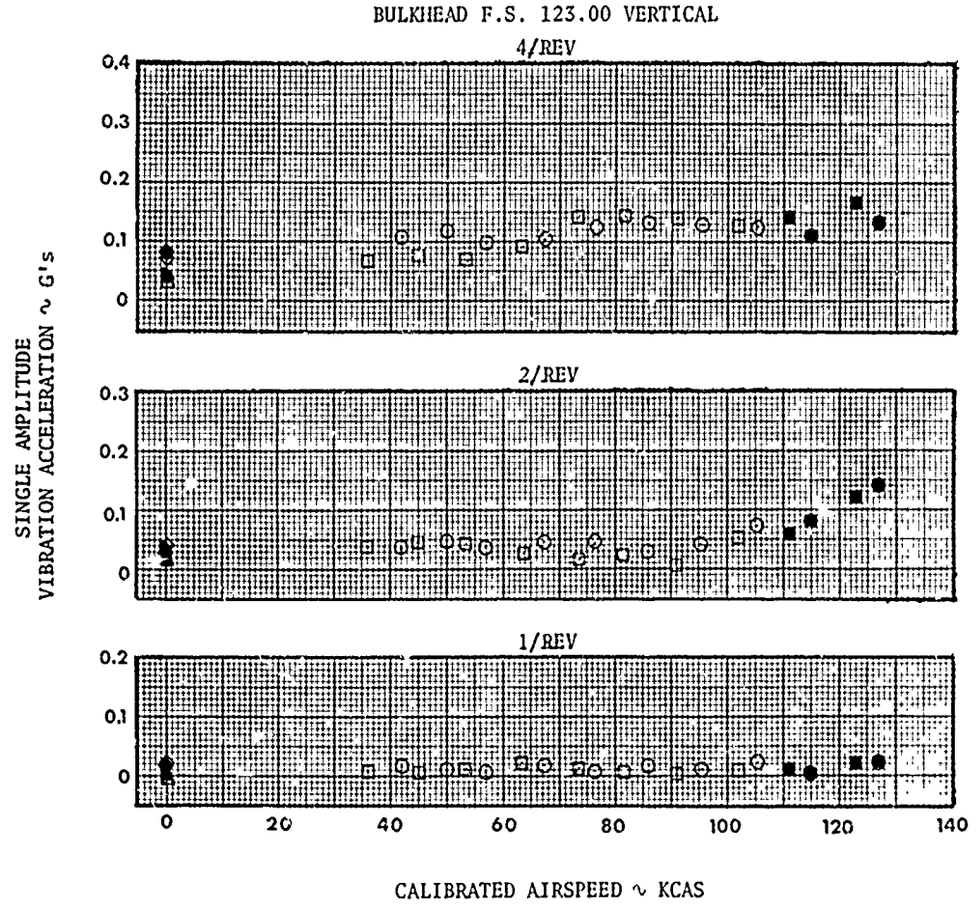


FIGURE 22 (CONTINUED)

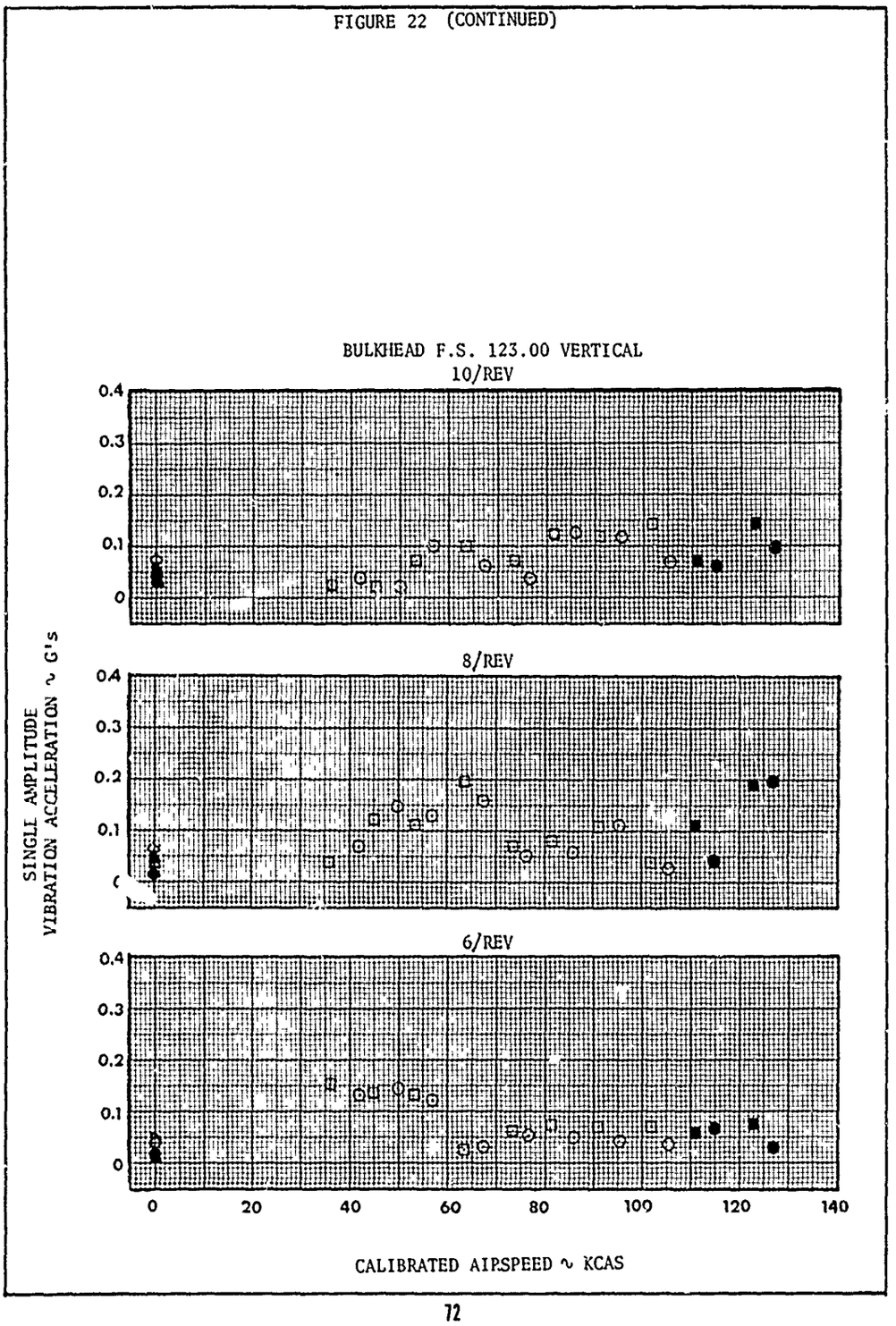


FIGURE 23

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	321	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
▶	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

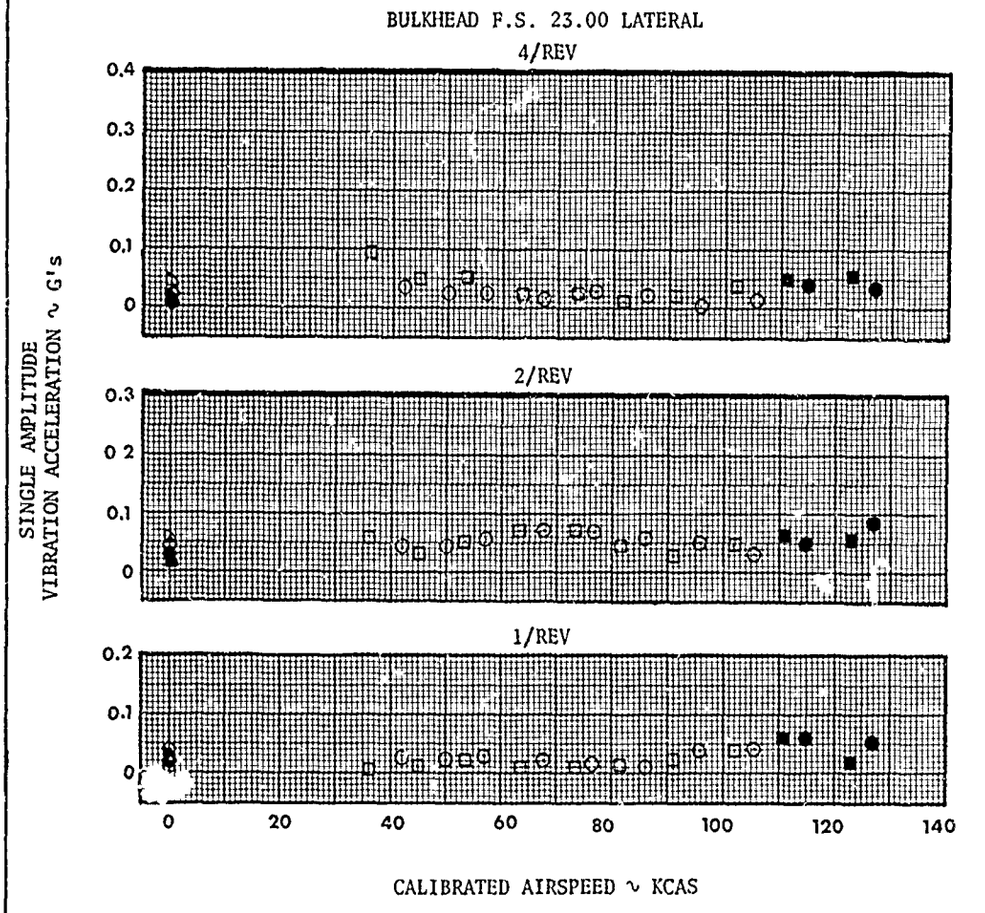


FIGURE 23 (CONTINUED)

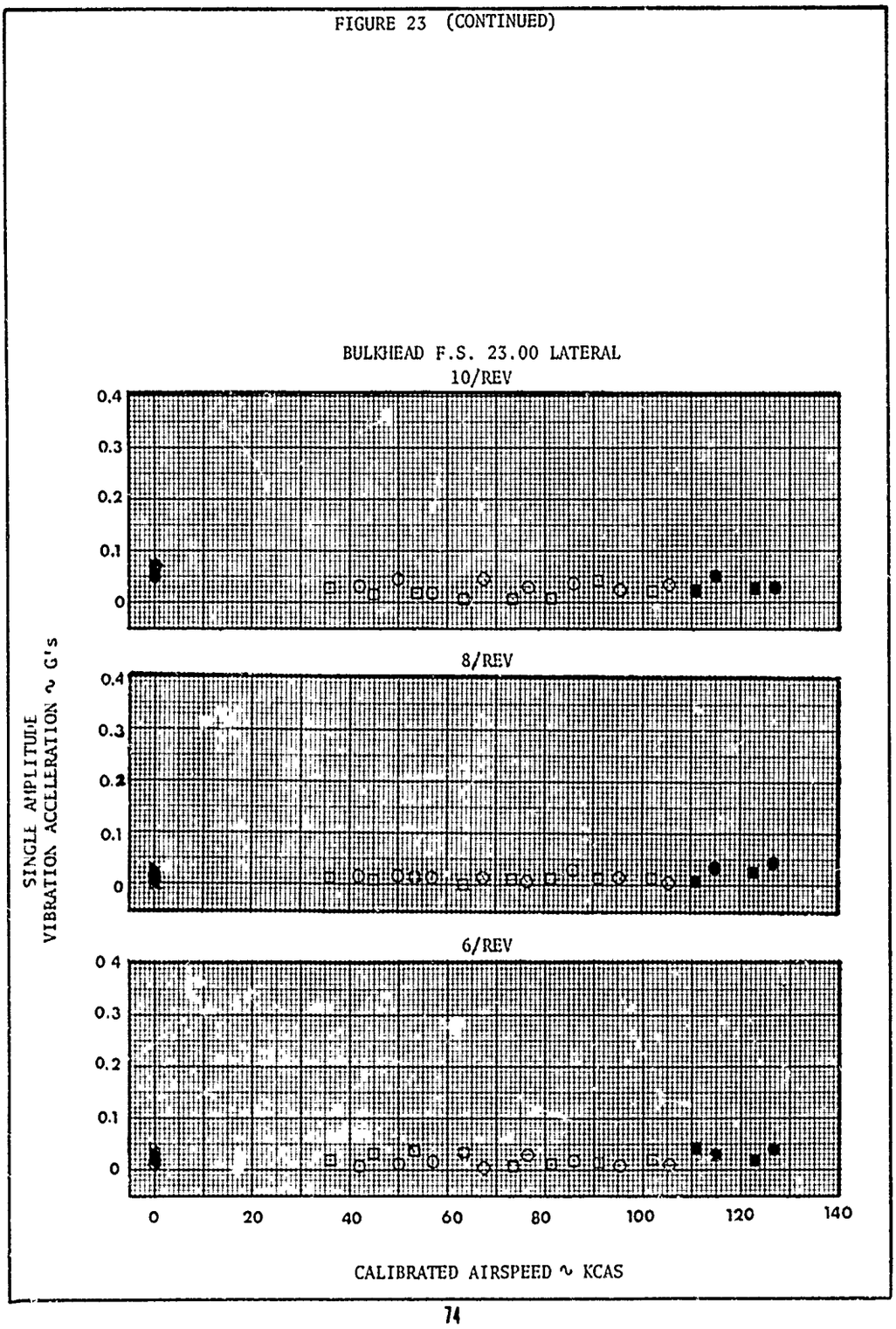


FIGURE 24

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
▣	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

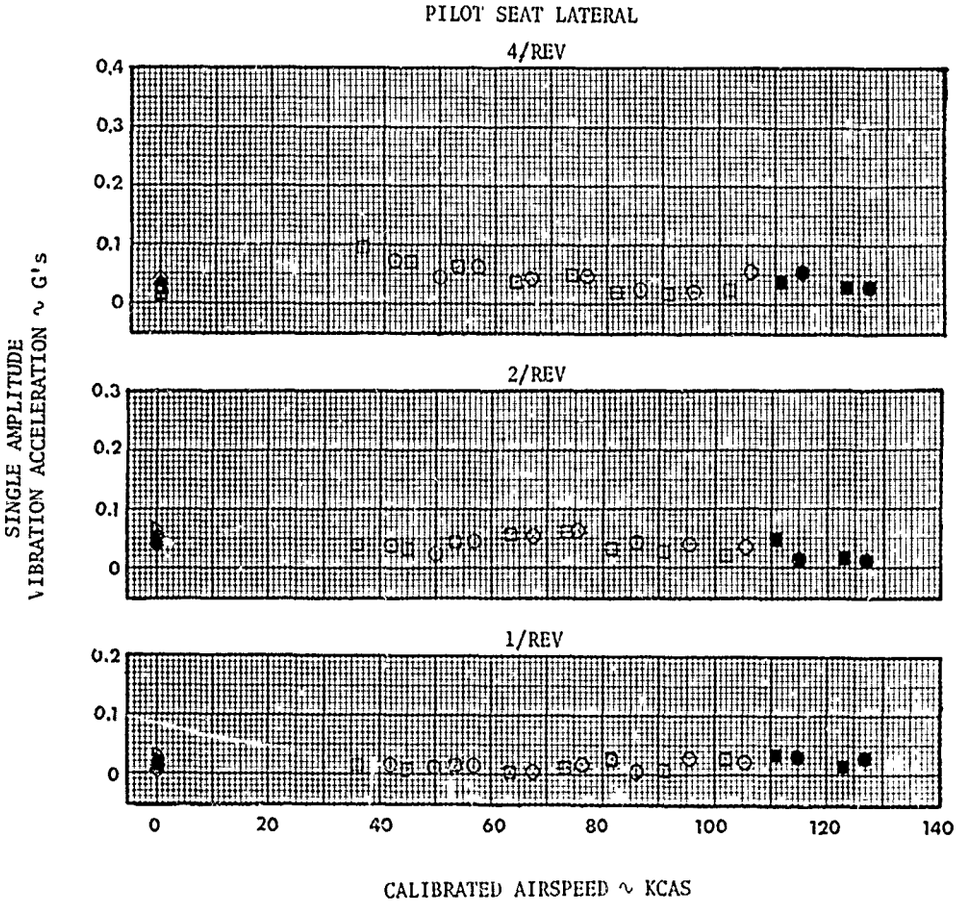


FIGURE 24 (CONTINUED)

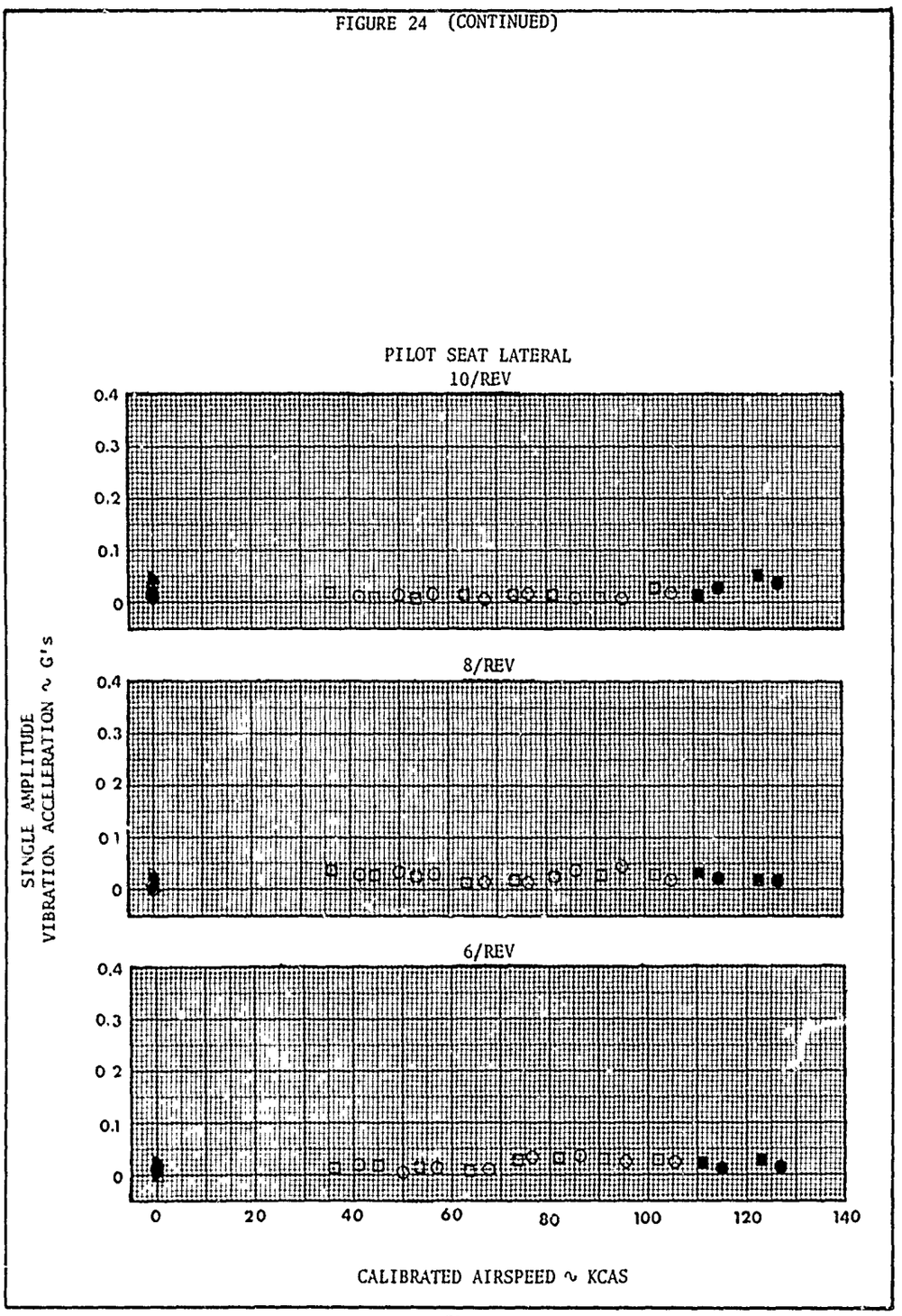


FIGURE 25

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

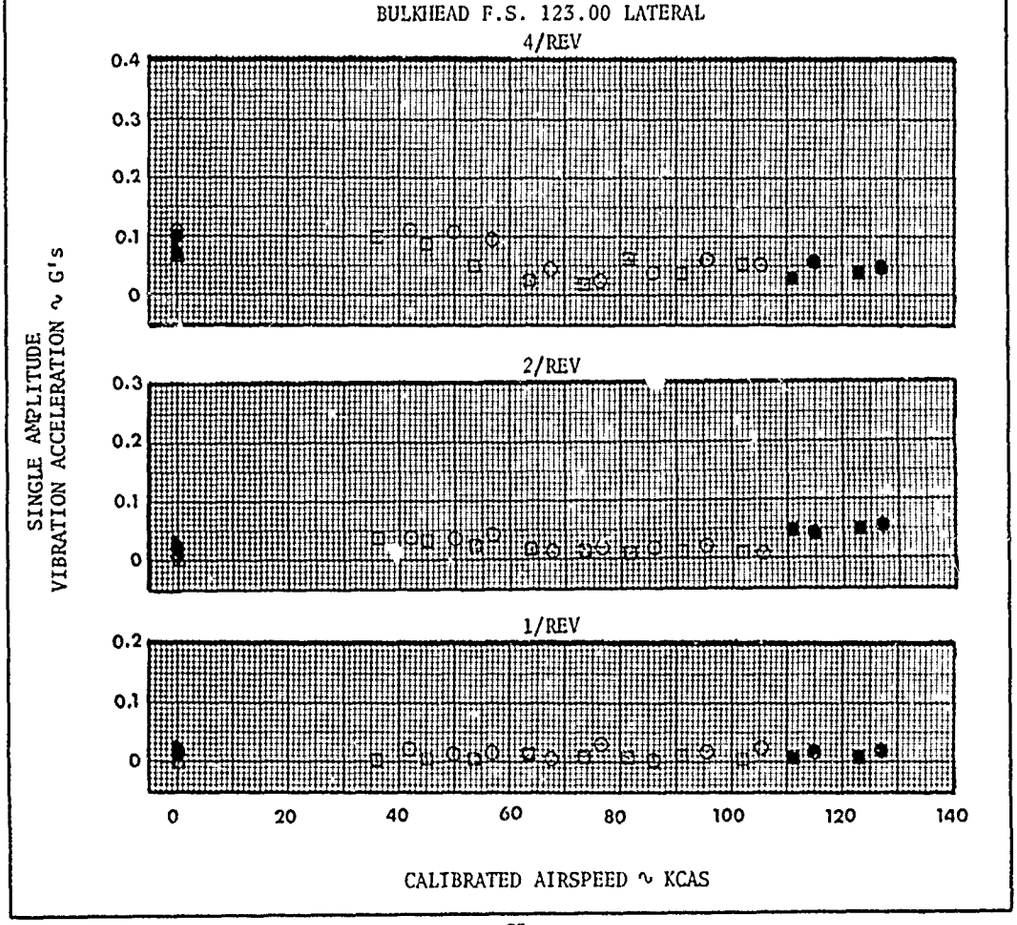


FIGURE 25 (CONTINUED)

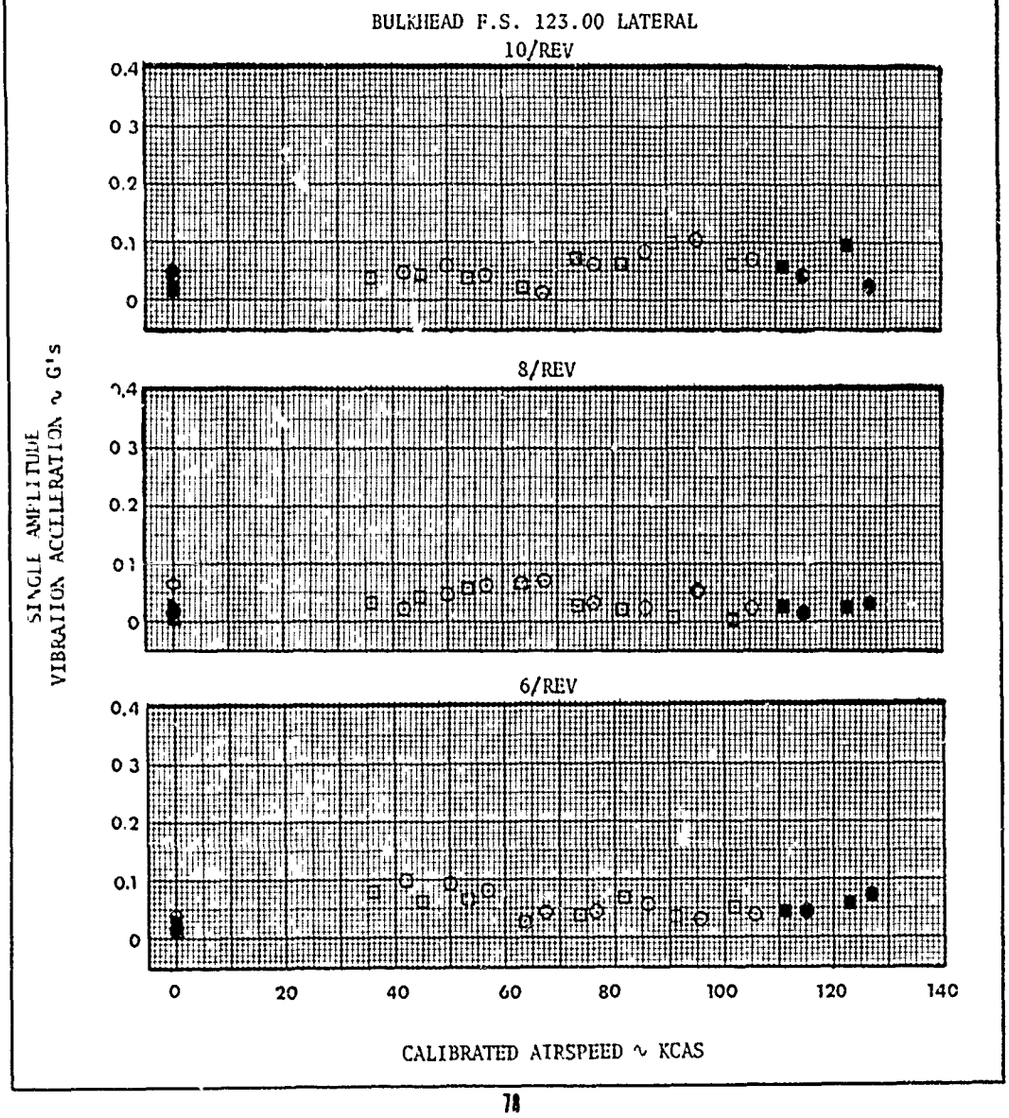


FIGURE 26

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▷	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◣	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

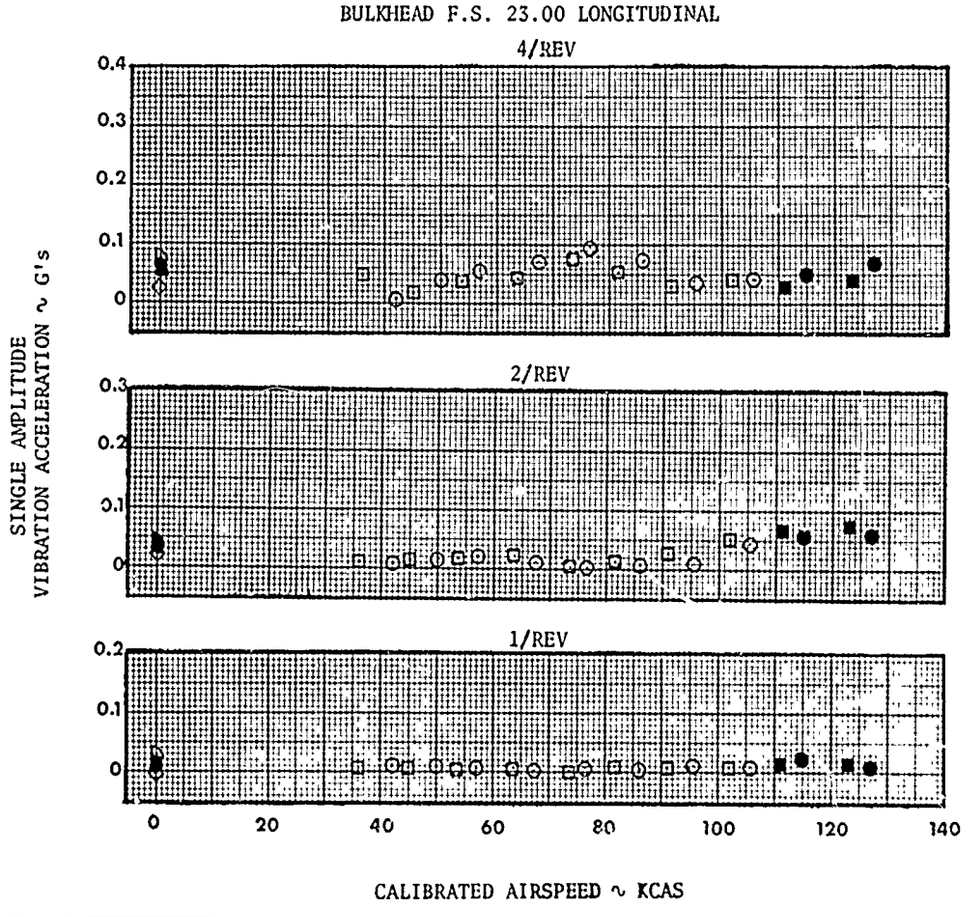


FIGURE 26 (CONTINUED)

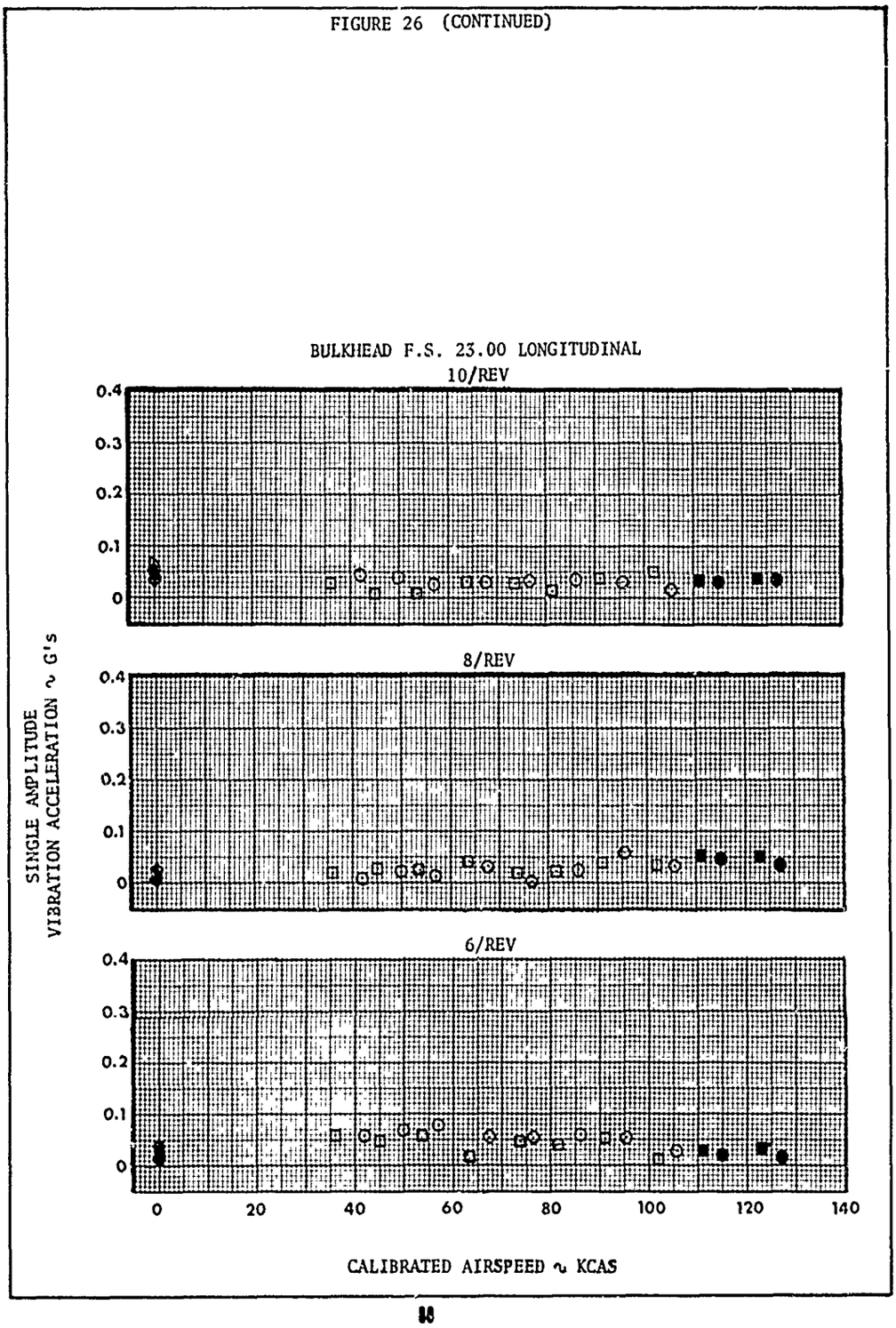


FIGURE 27

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9520	585	129.2	0.2 RT	321	REMOVED	HOVERING FLT
□	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
■	9200	2390	128.9	0.2 RT	320	REMOVED	DIVING FLT
▱	8710	810	128.5	0.3 RT	321	REMOVED	HOVERING FLT
◆	9500	890	129.2	0.7 RT	320	INSTALL	HOVERING FLT
○	9320	2470	128.9	0.8 RT	322	INSTALL	LEVEL FLT
●	9160	2470	128.8	0.8 RT	322	INSTALL	DIVING FLT
◤	8750	1120	128.5	0.8 RT	320	INSTALL	HOVERING FLT

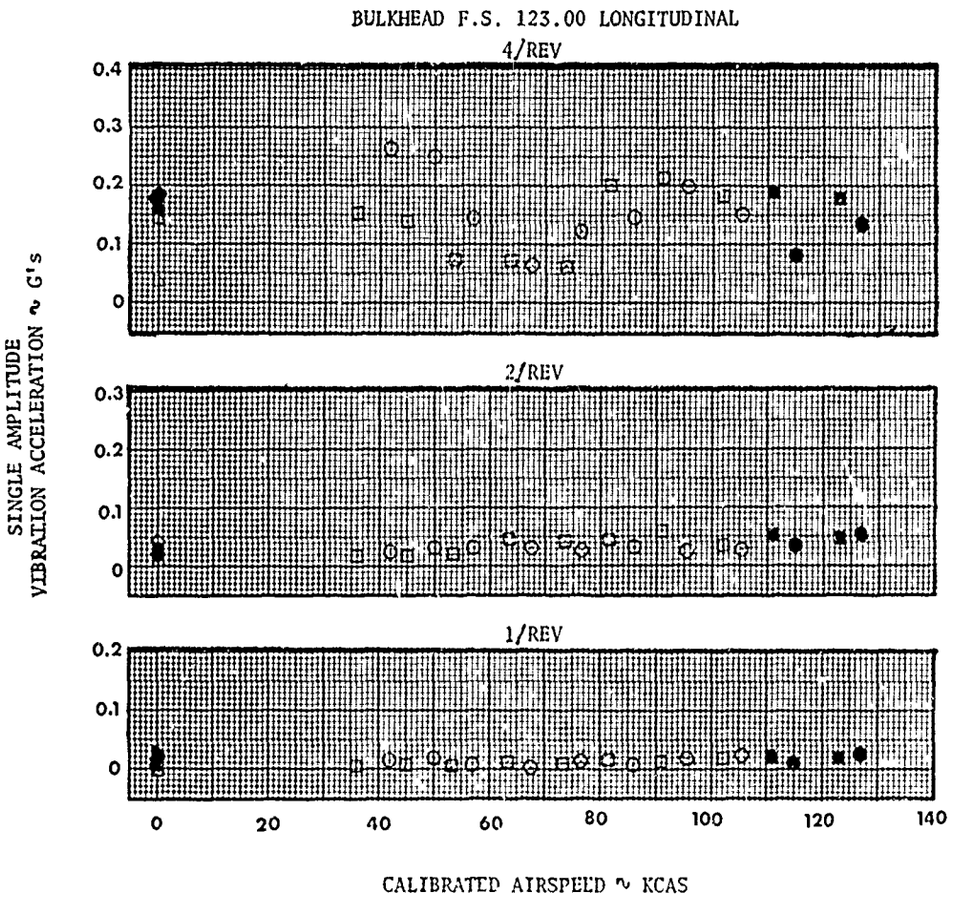


FIGURE 27 (CONTINUED)

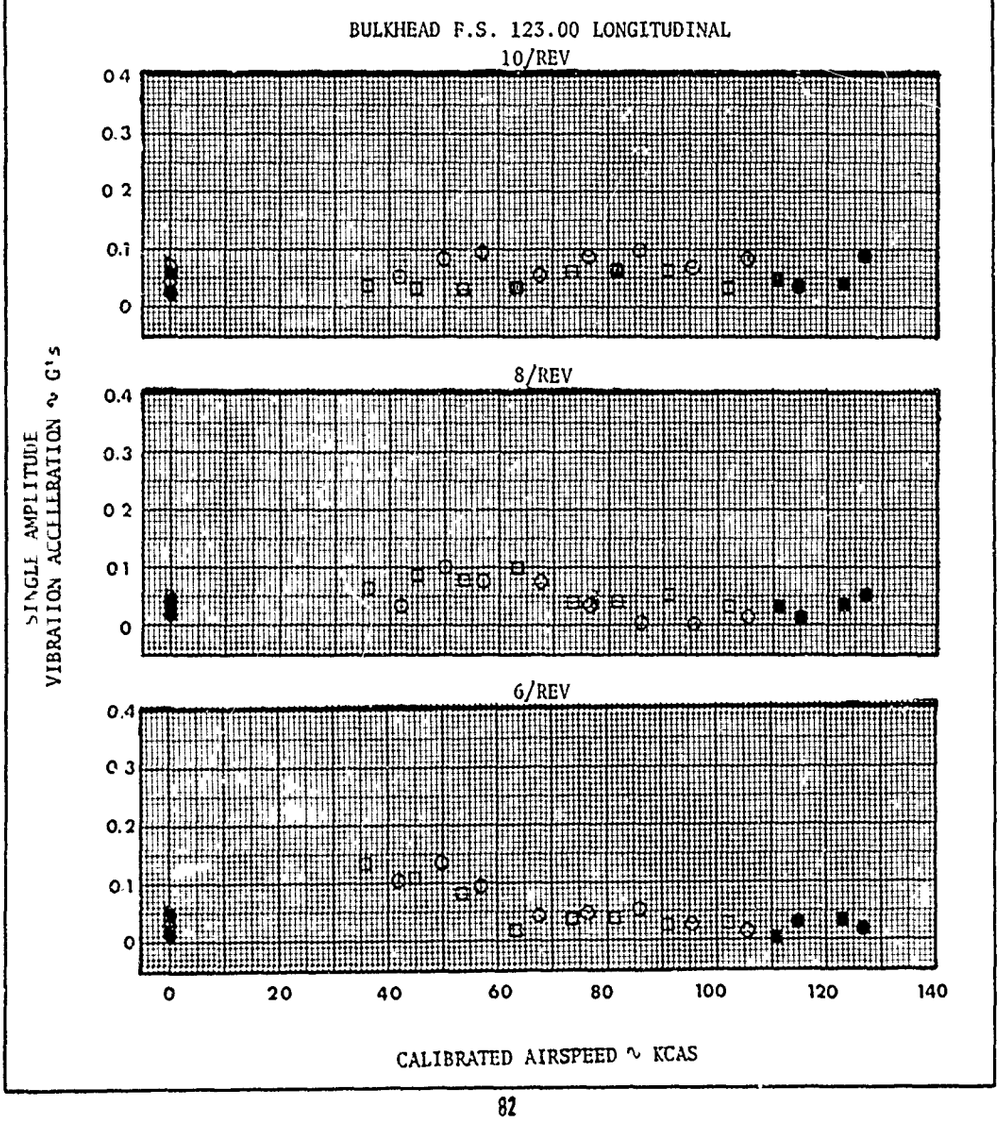


FIGURE 28

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

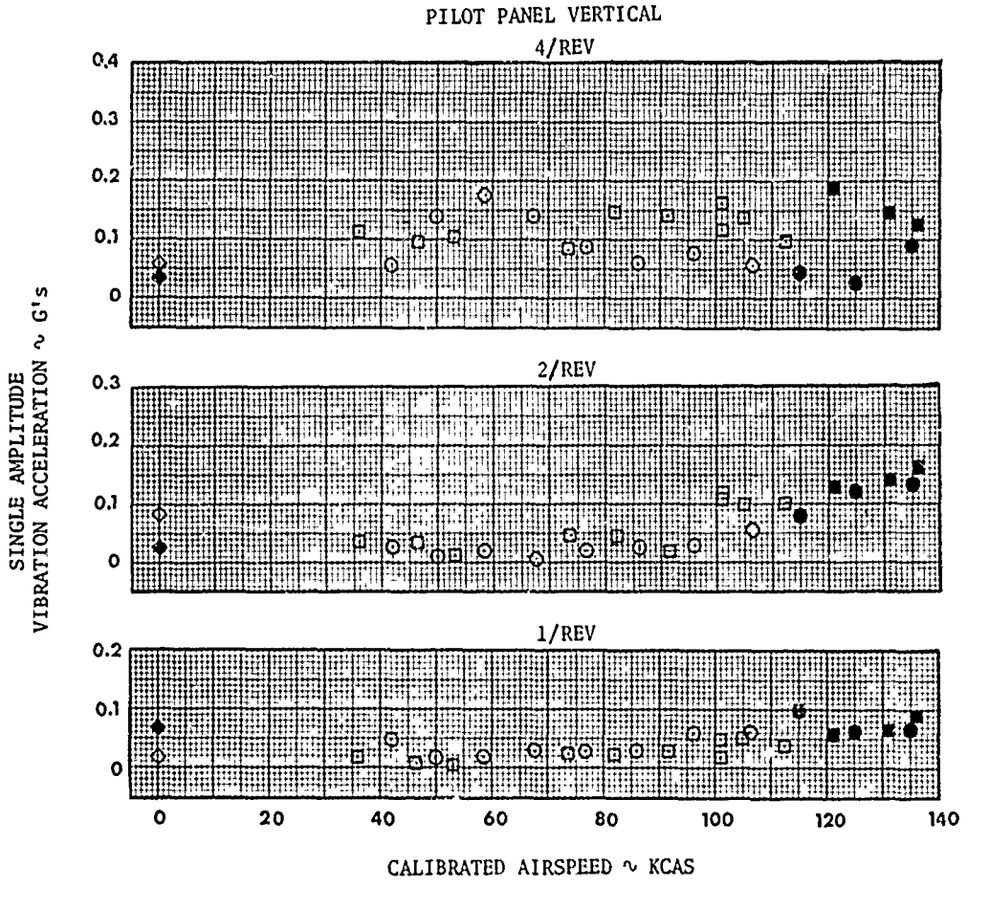


FIGURE 28 (CONTINUED)

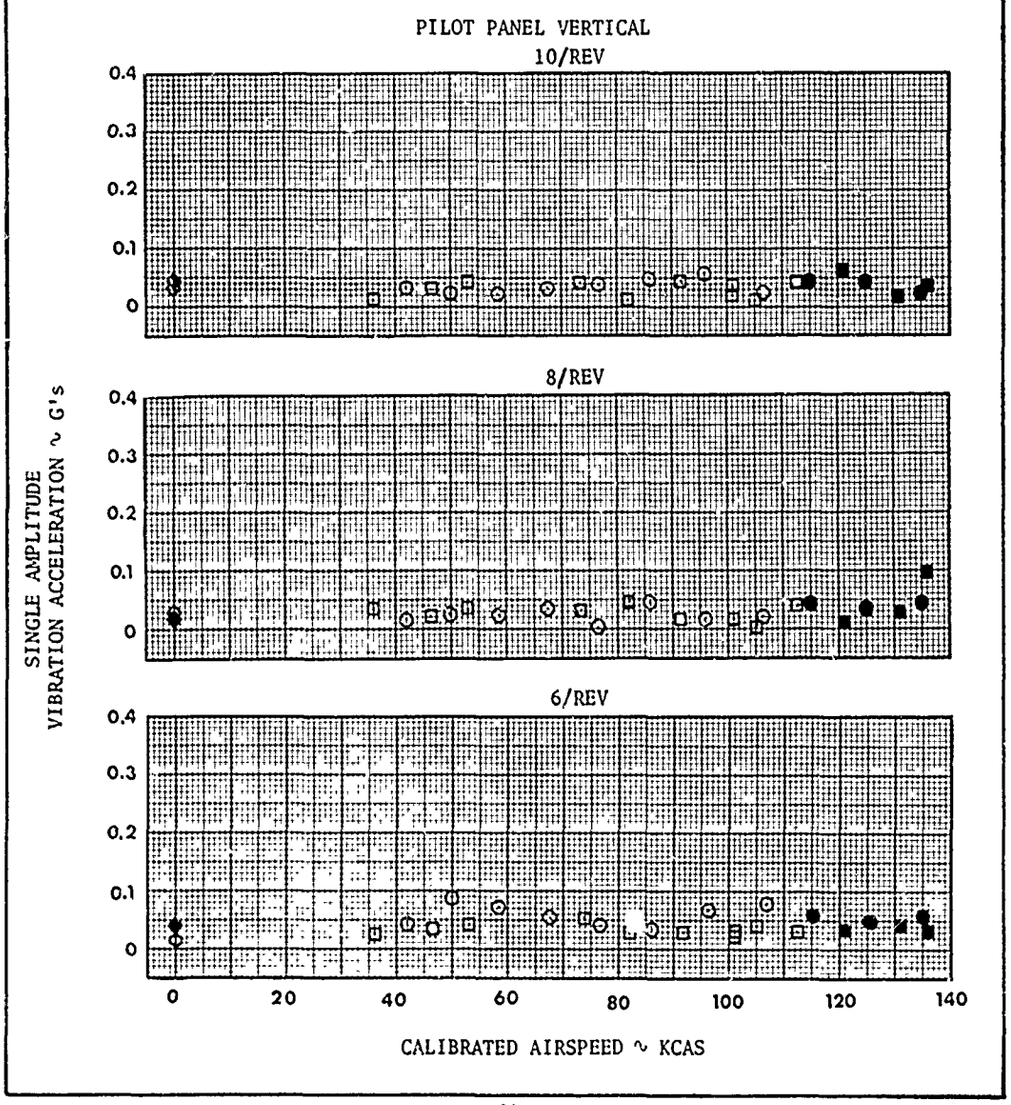


FIGURE 29
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

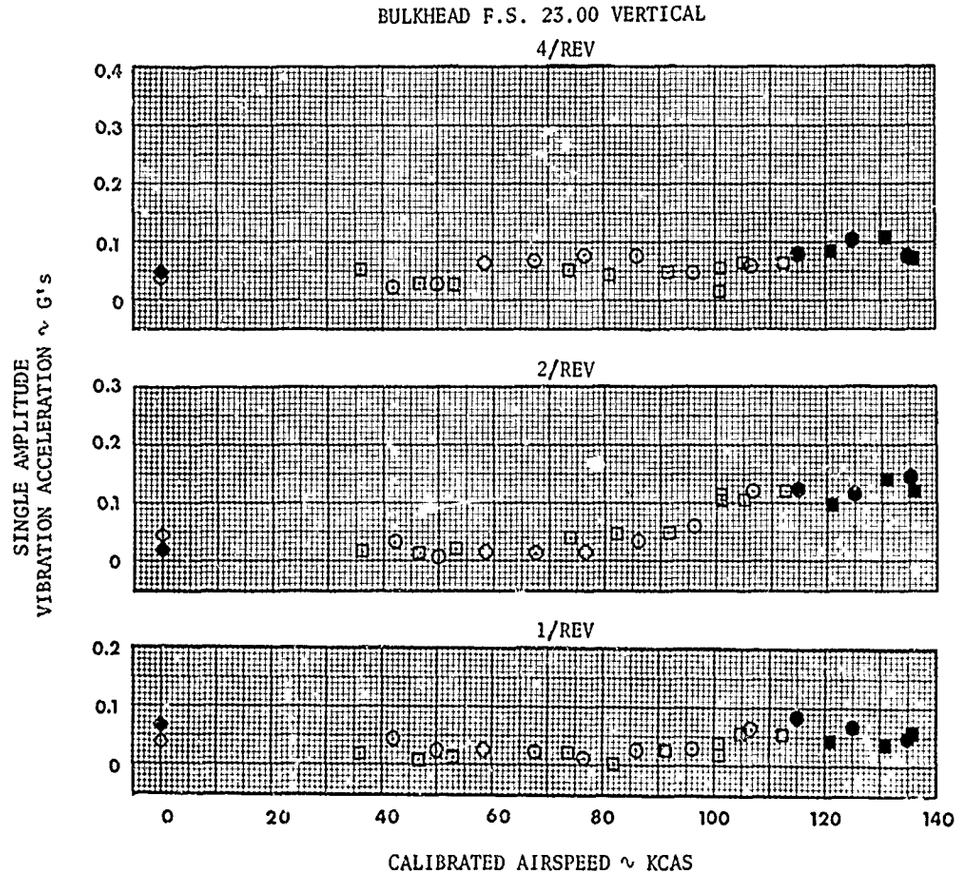


FIGURE 29 (CONTINUED)

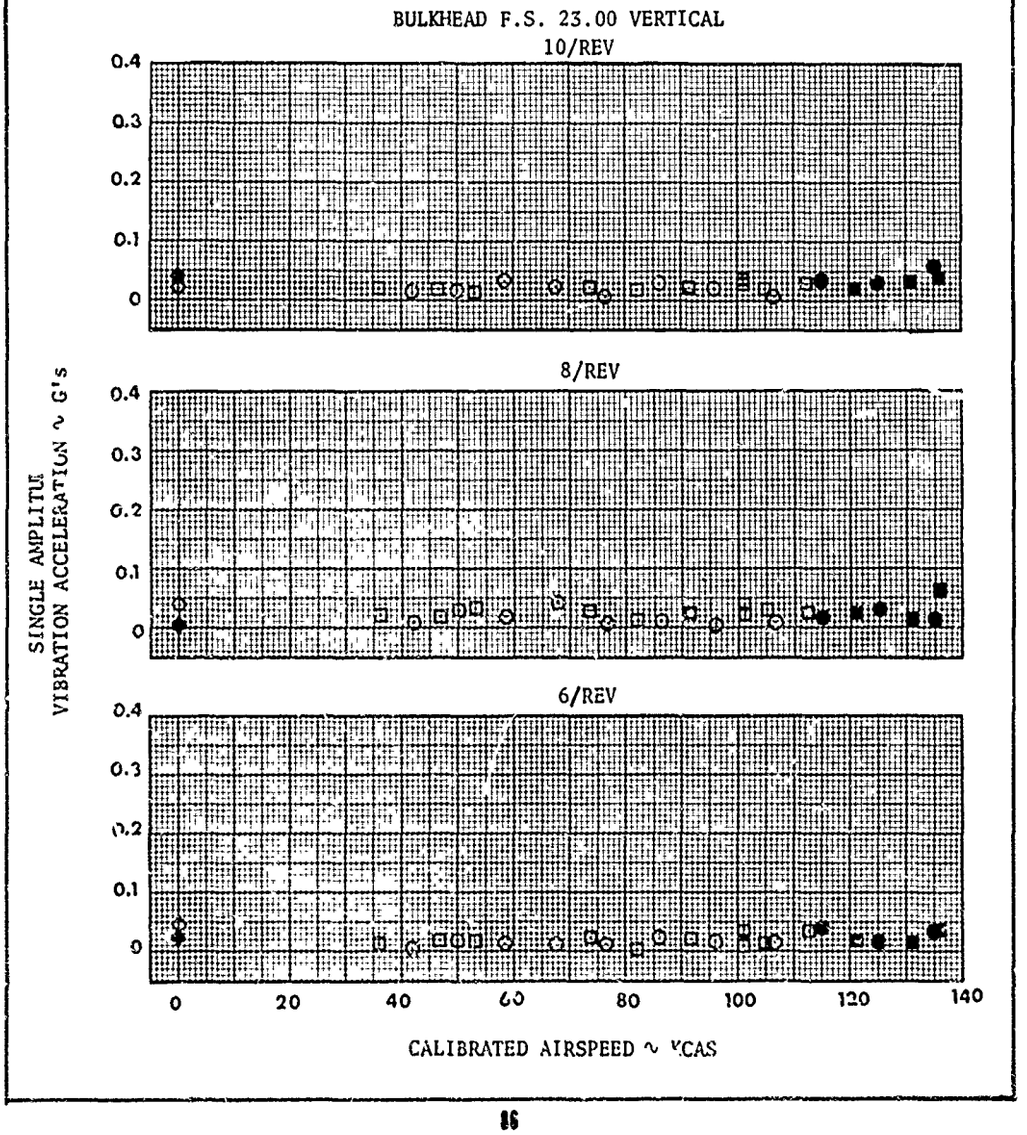


FIGURE 30

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

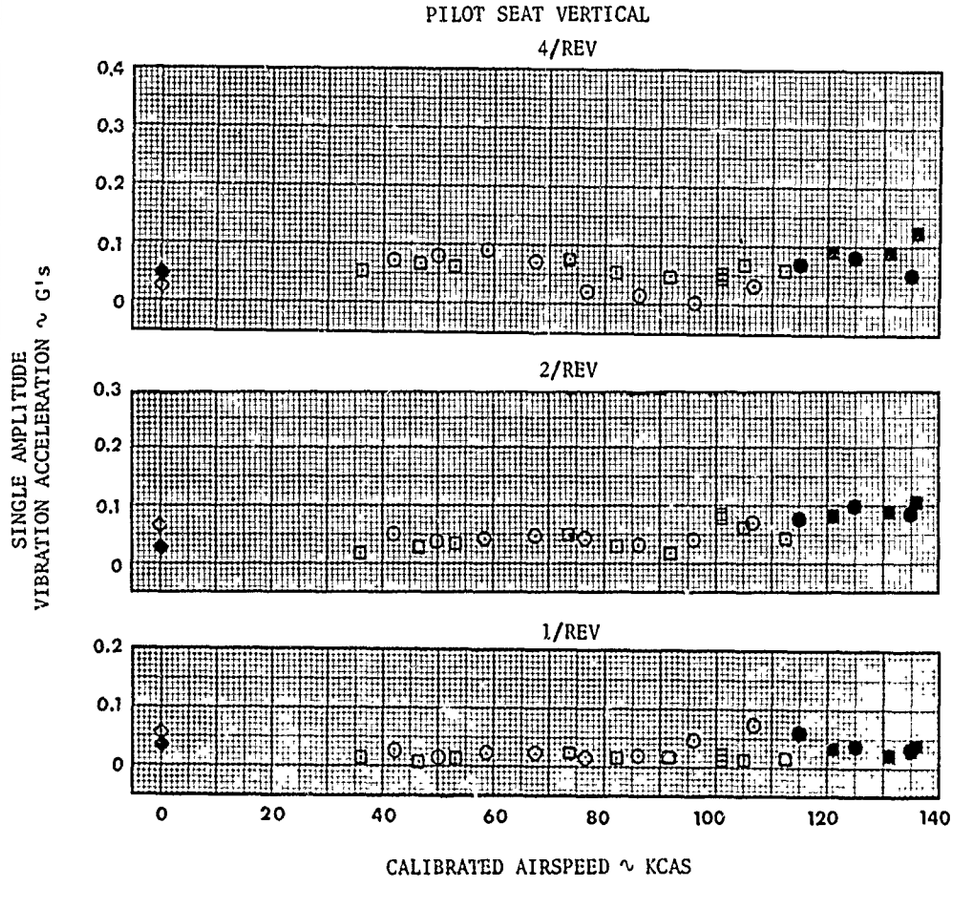


FIGURE 30 (CONTINUED)

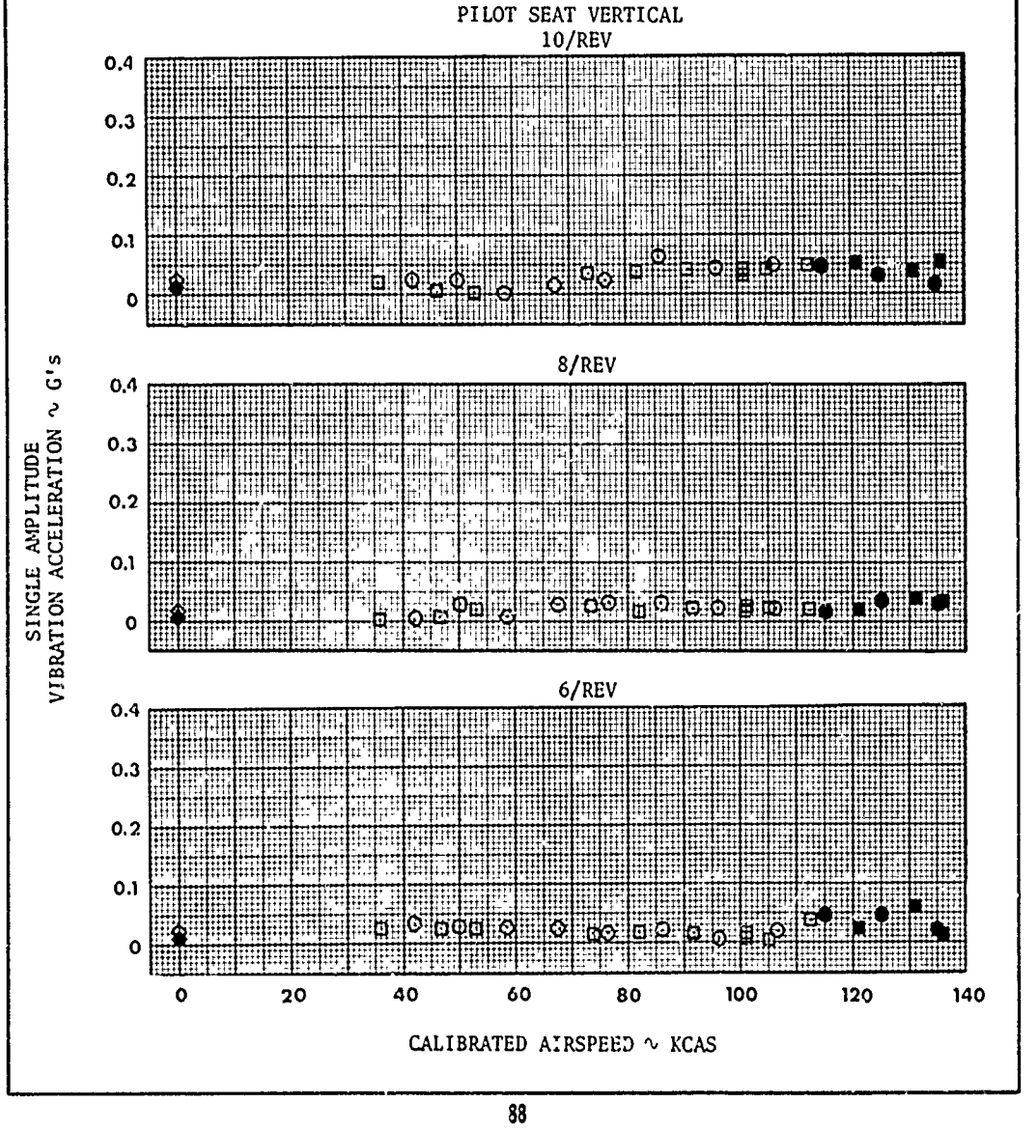


FIGURE 31
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

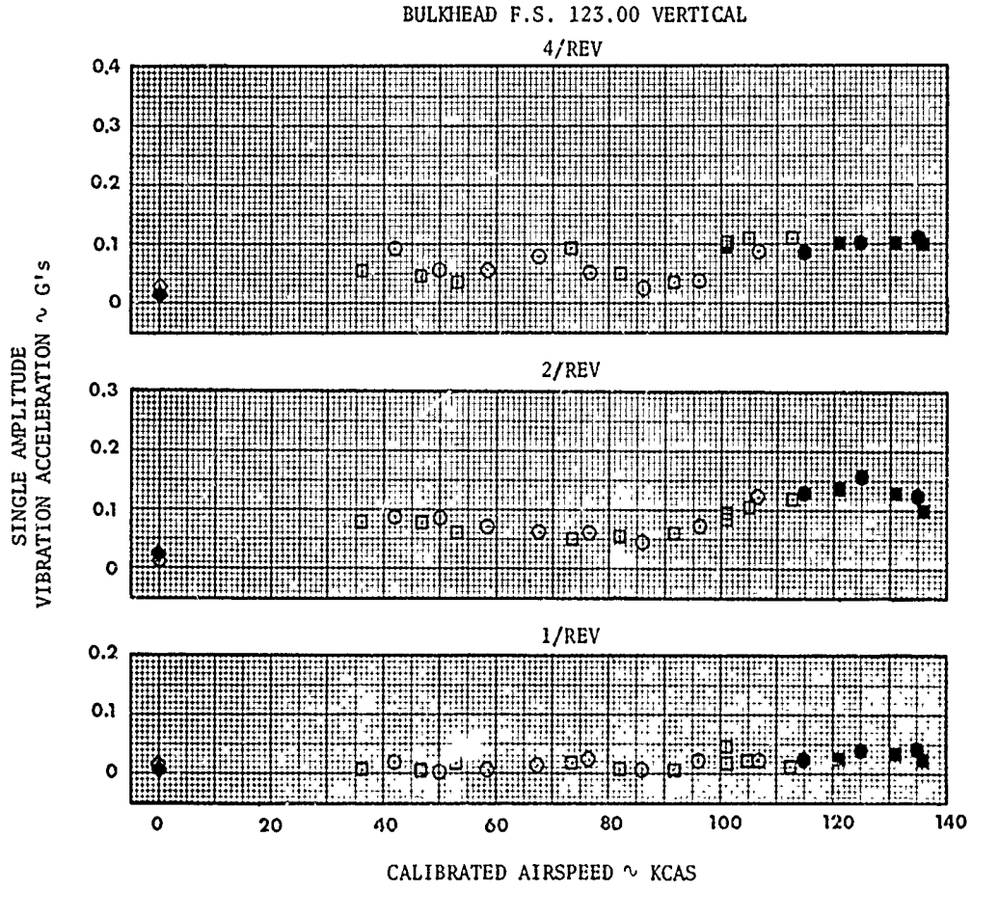


FIGURE 31 (CONTINUED)

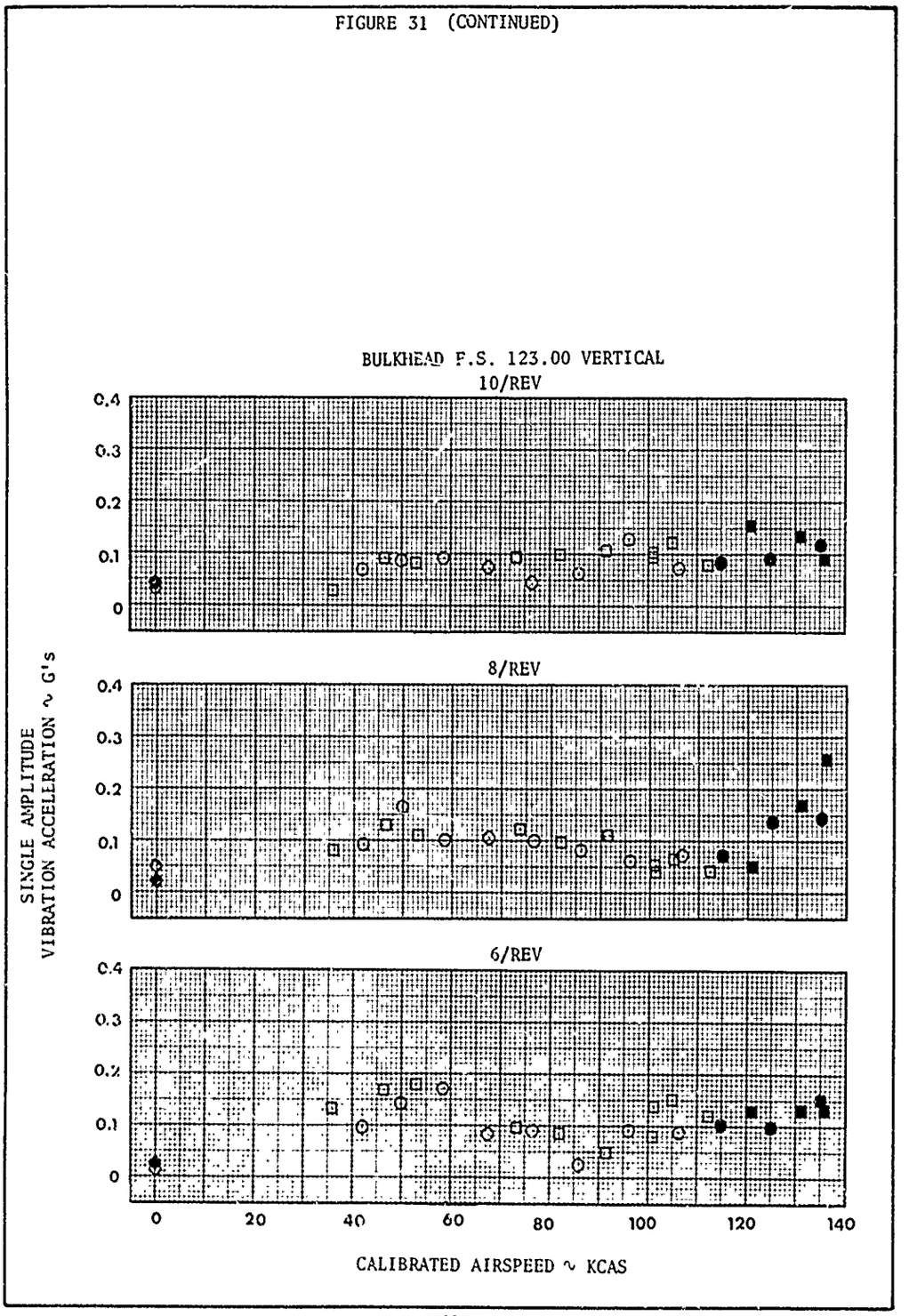


FIGURE 32
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

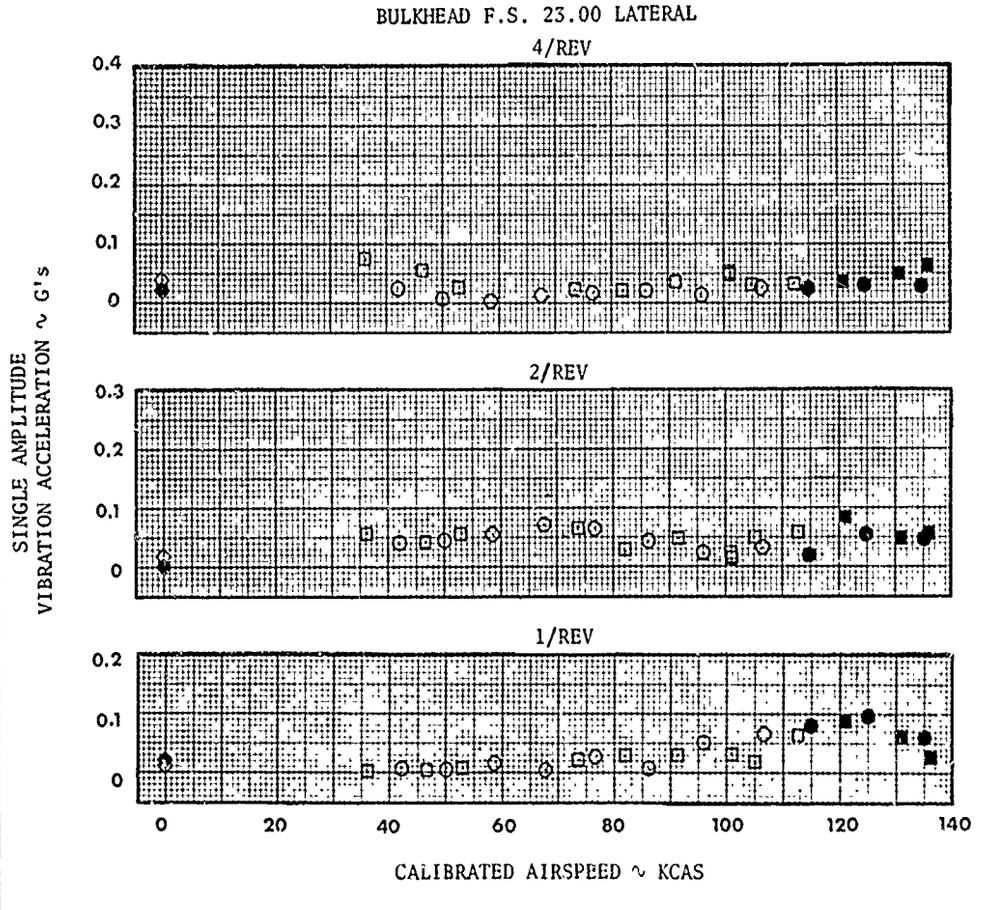


FIGURE 32 (CONTINUED)

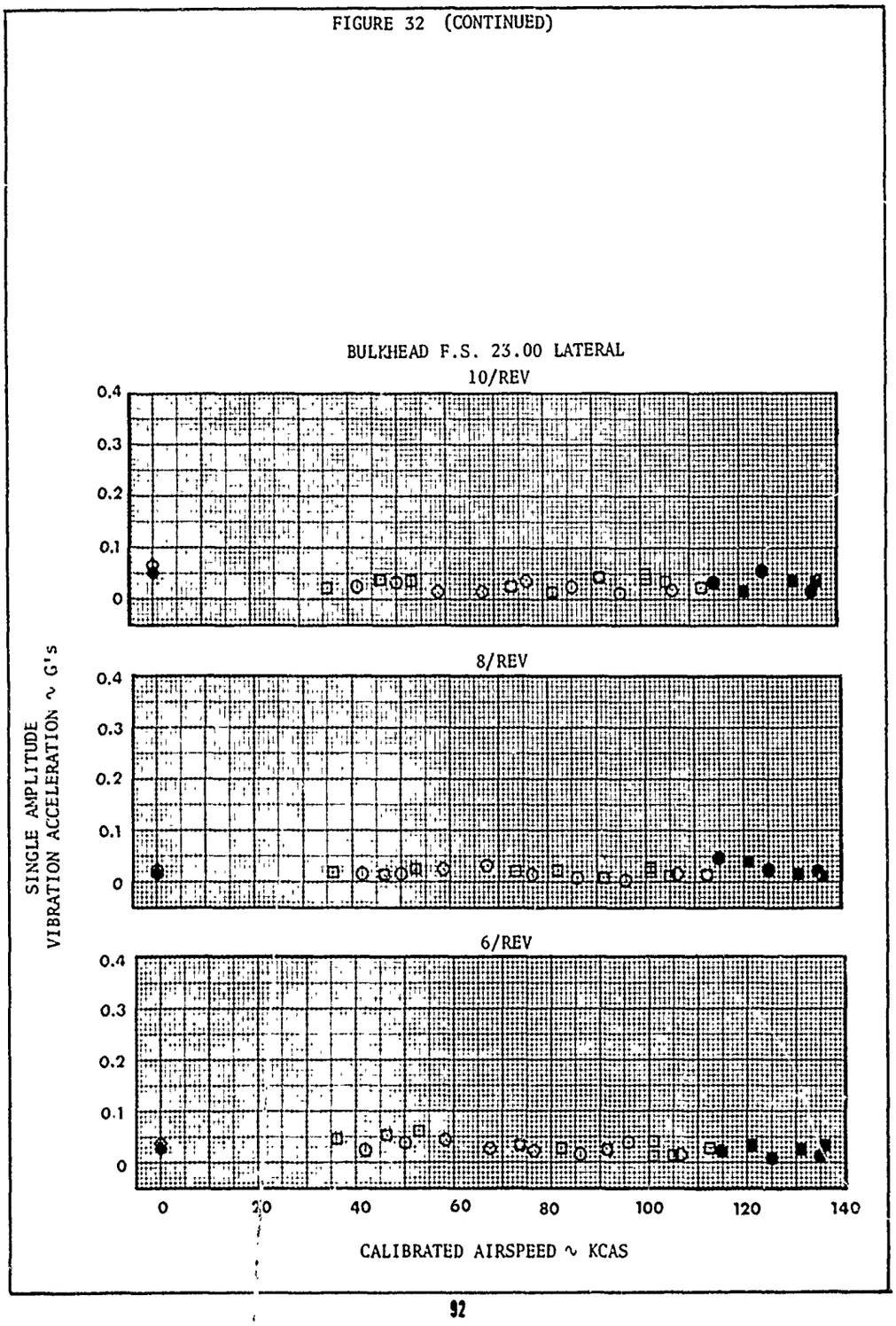


FIGURE 33
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

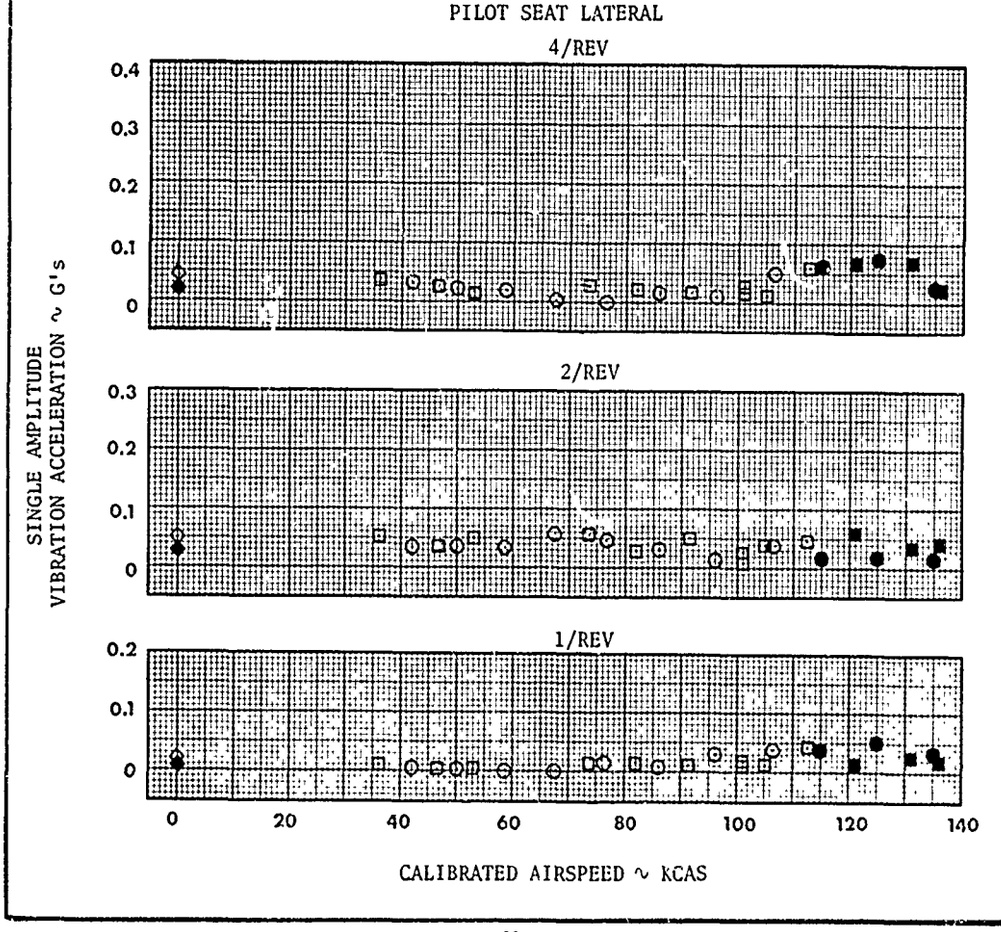


FIGURE 33 (CONTINUED)

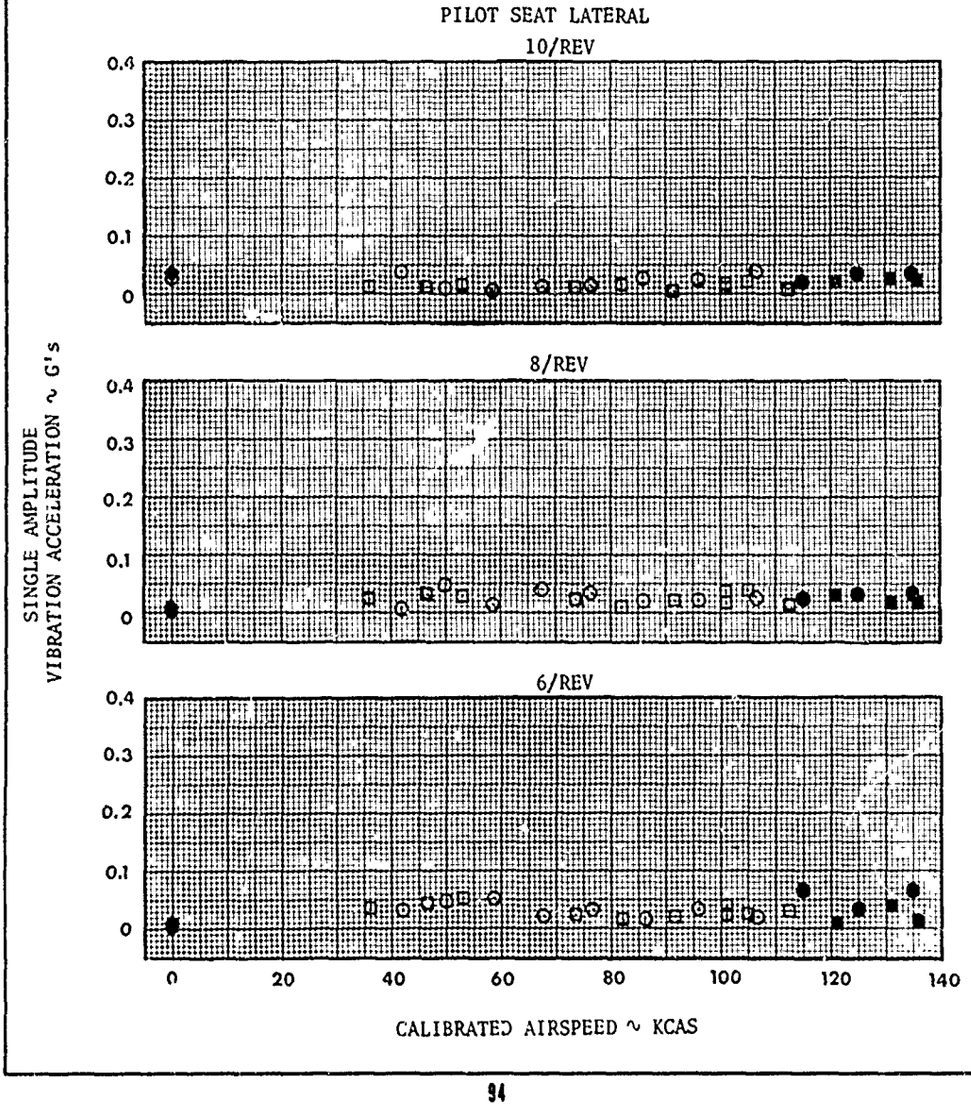


FIGURE 34
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	G LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

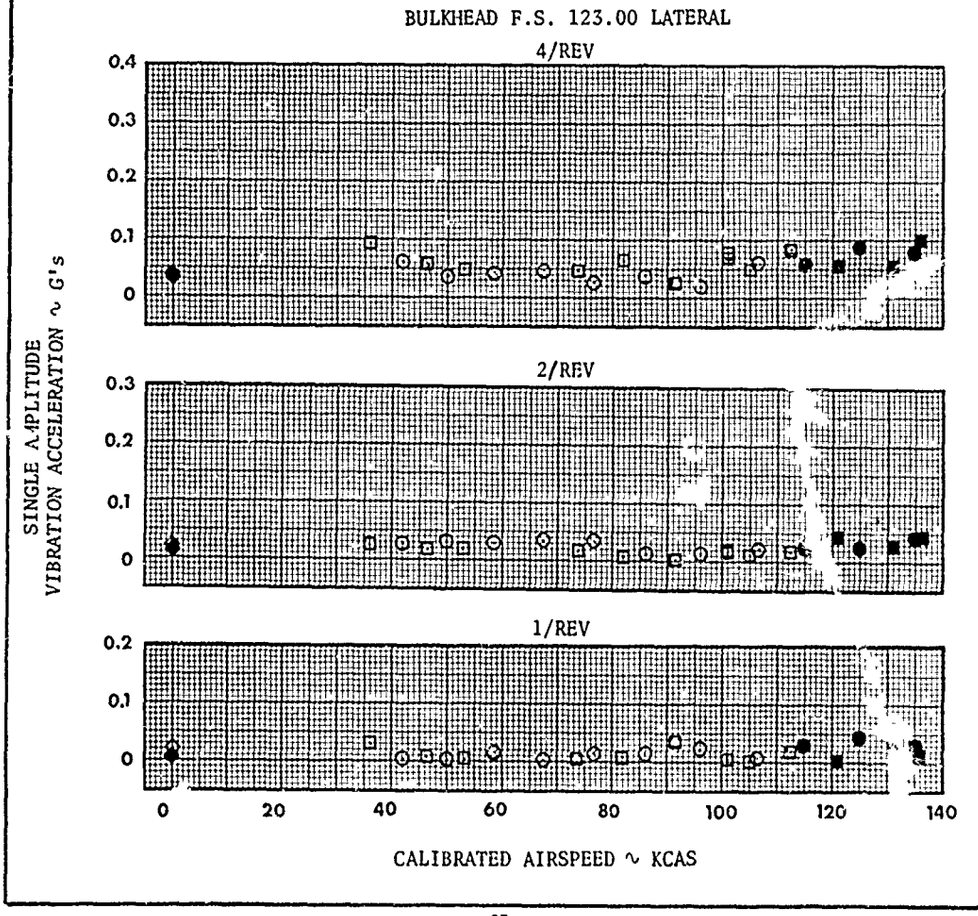


FIGURE 34 (CONTINUED)

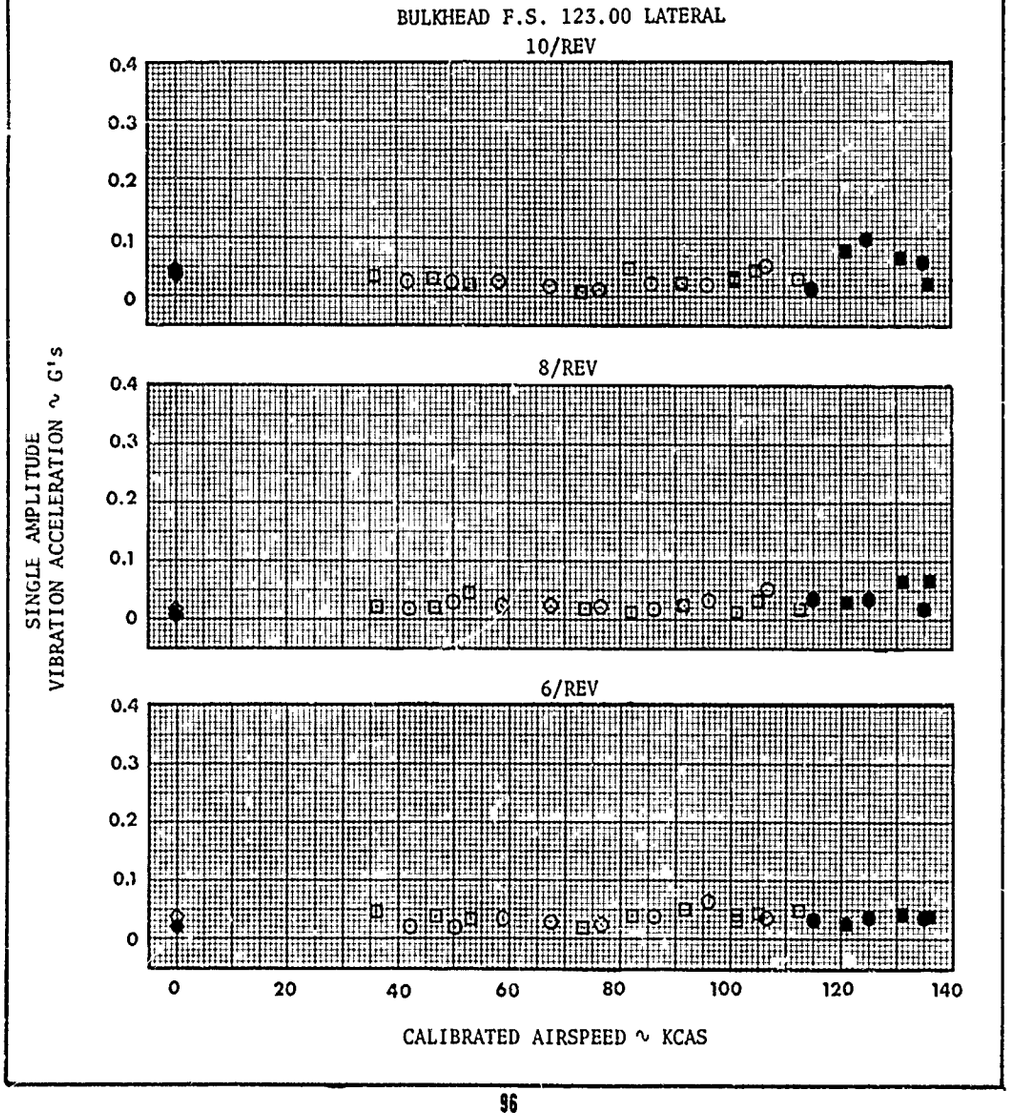


FIGURE 35
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

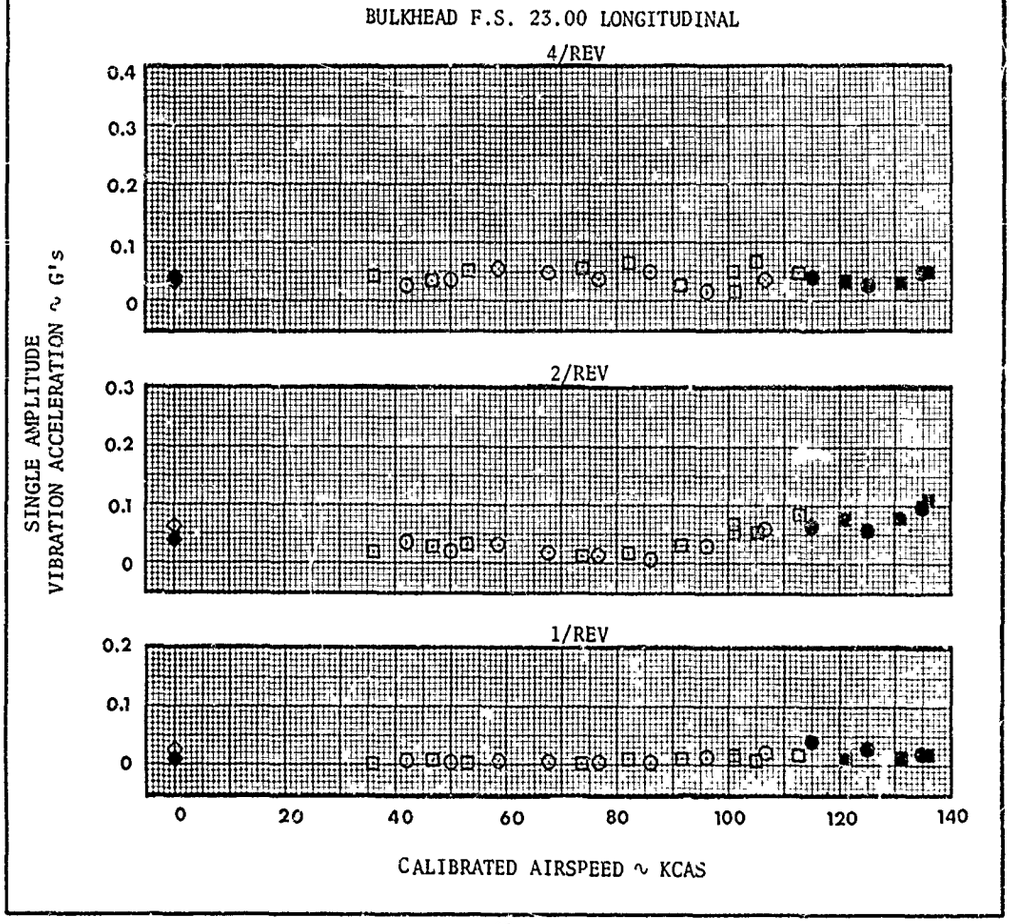


FIGURE 35 (CONTINUED)

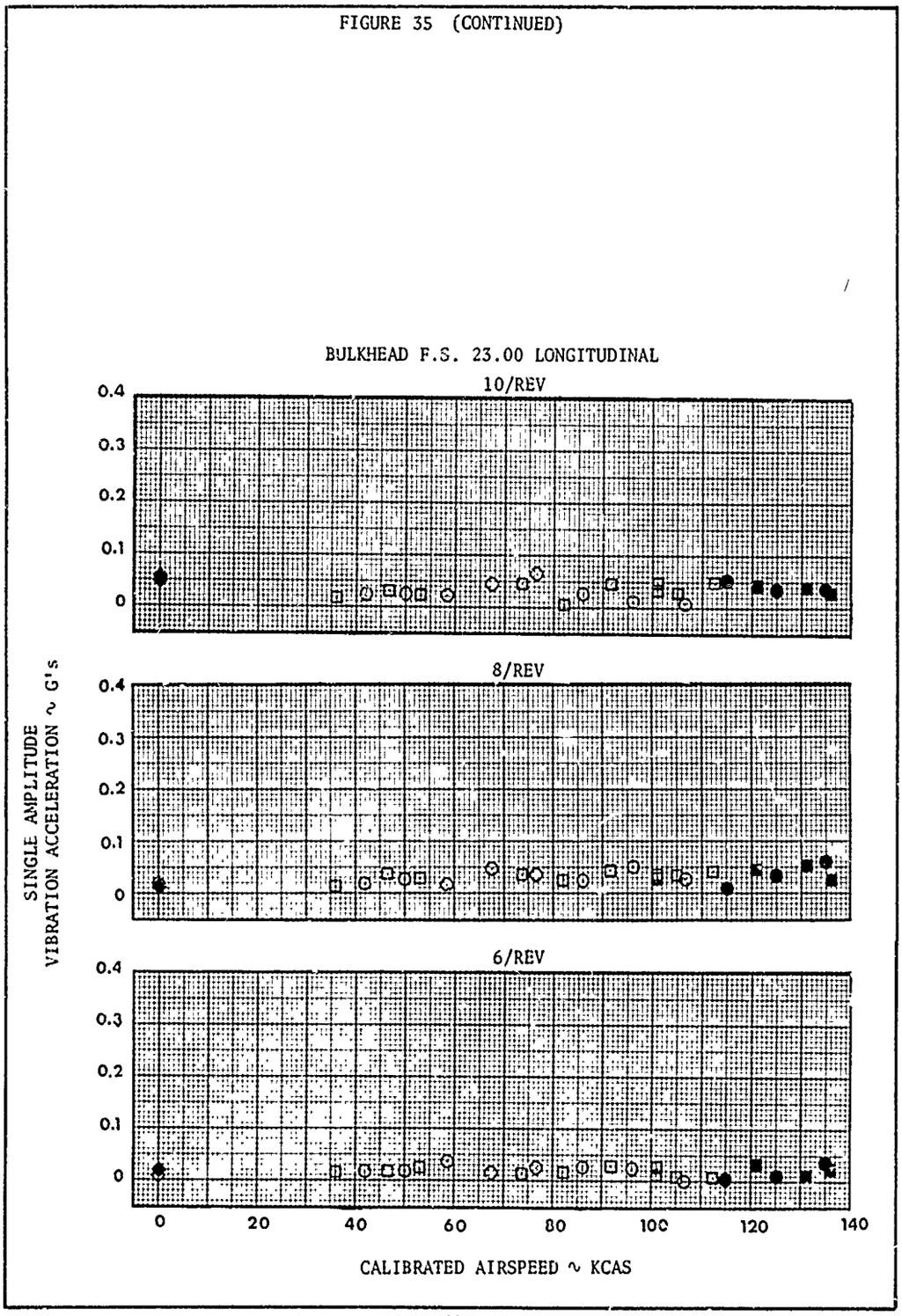


FIGURE 36
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	320	REMOVED	LEVEL FLT
●	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
□	7460	4990	135.7	0.5 RT	322	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	322	REMOVED	DIVING FLT

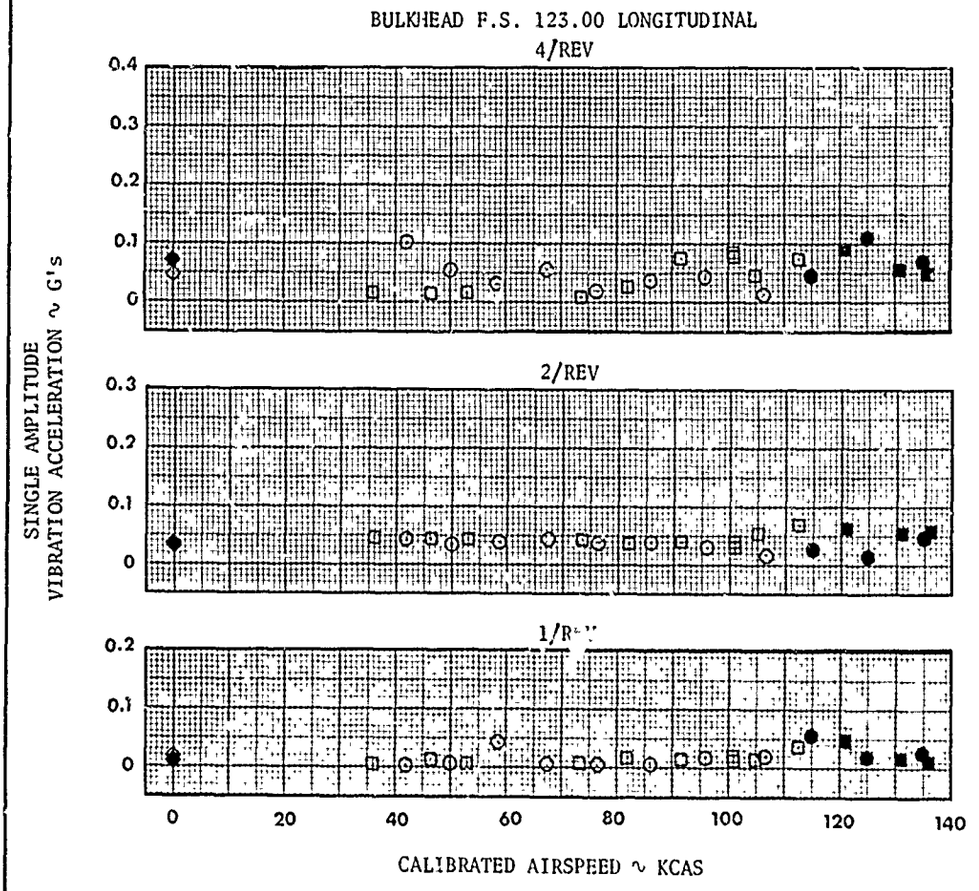


FIGURE 56 (CONTINUED)

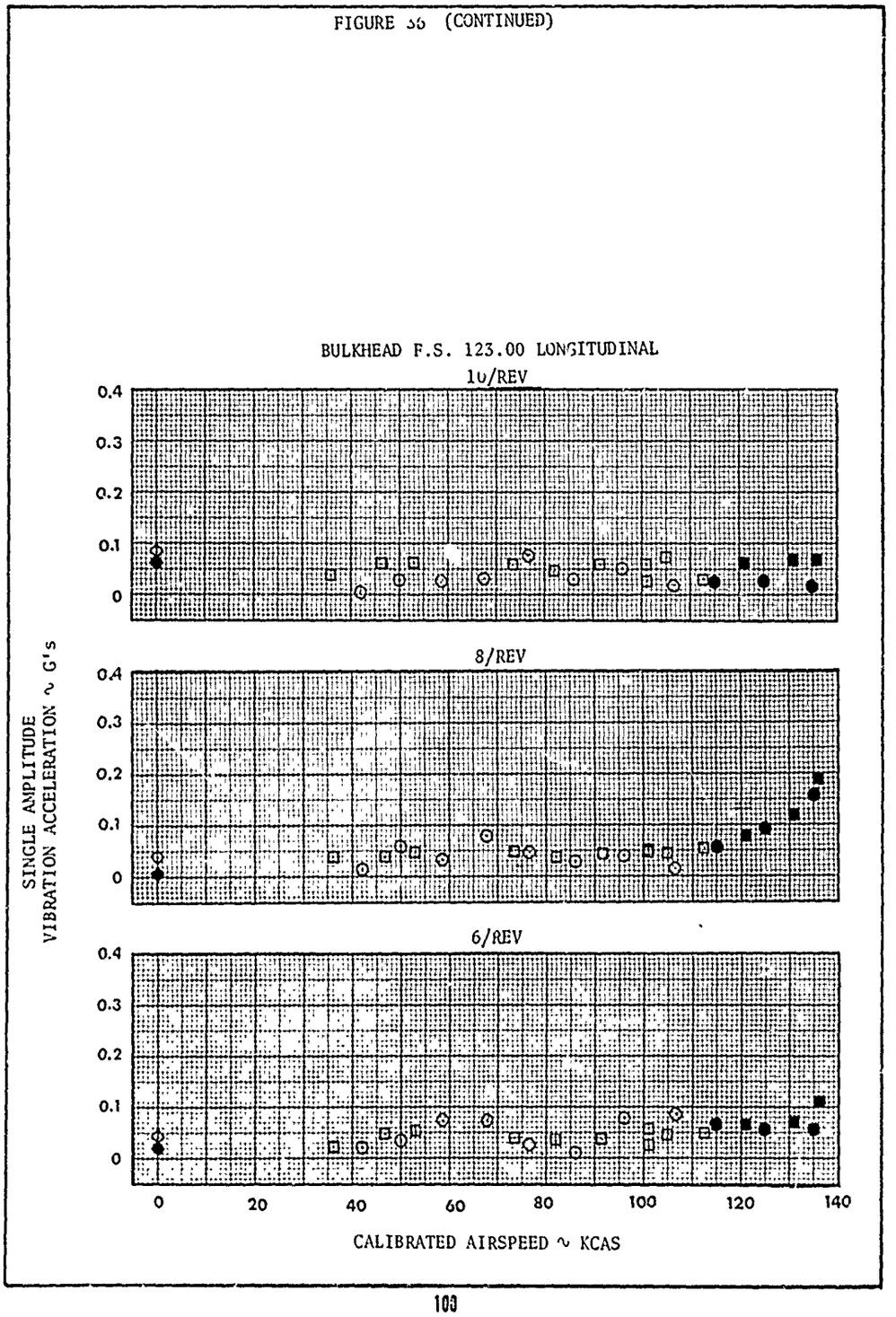


FIGURE 37
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

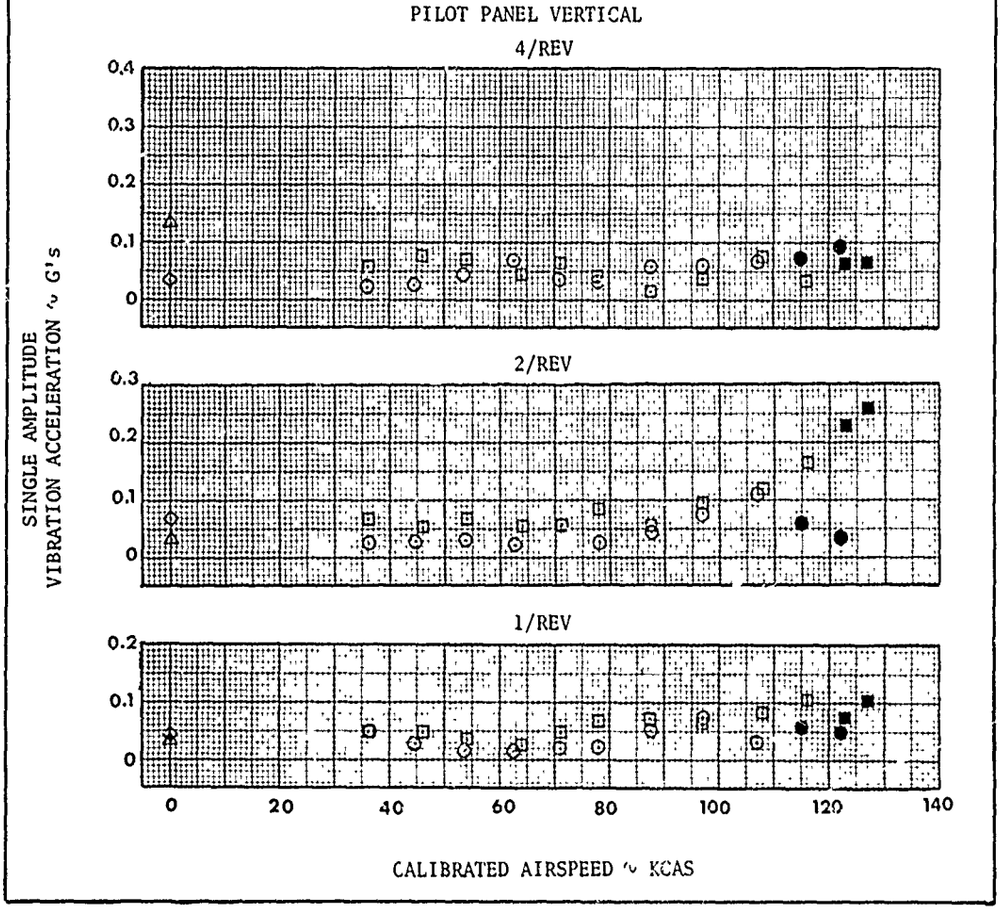


FIGURE 37 (CONTINUED)

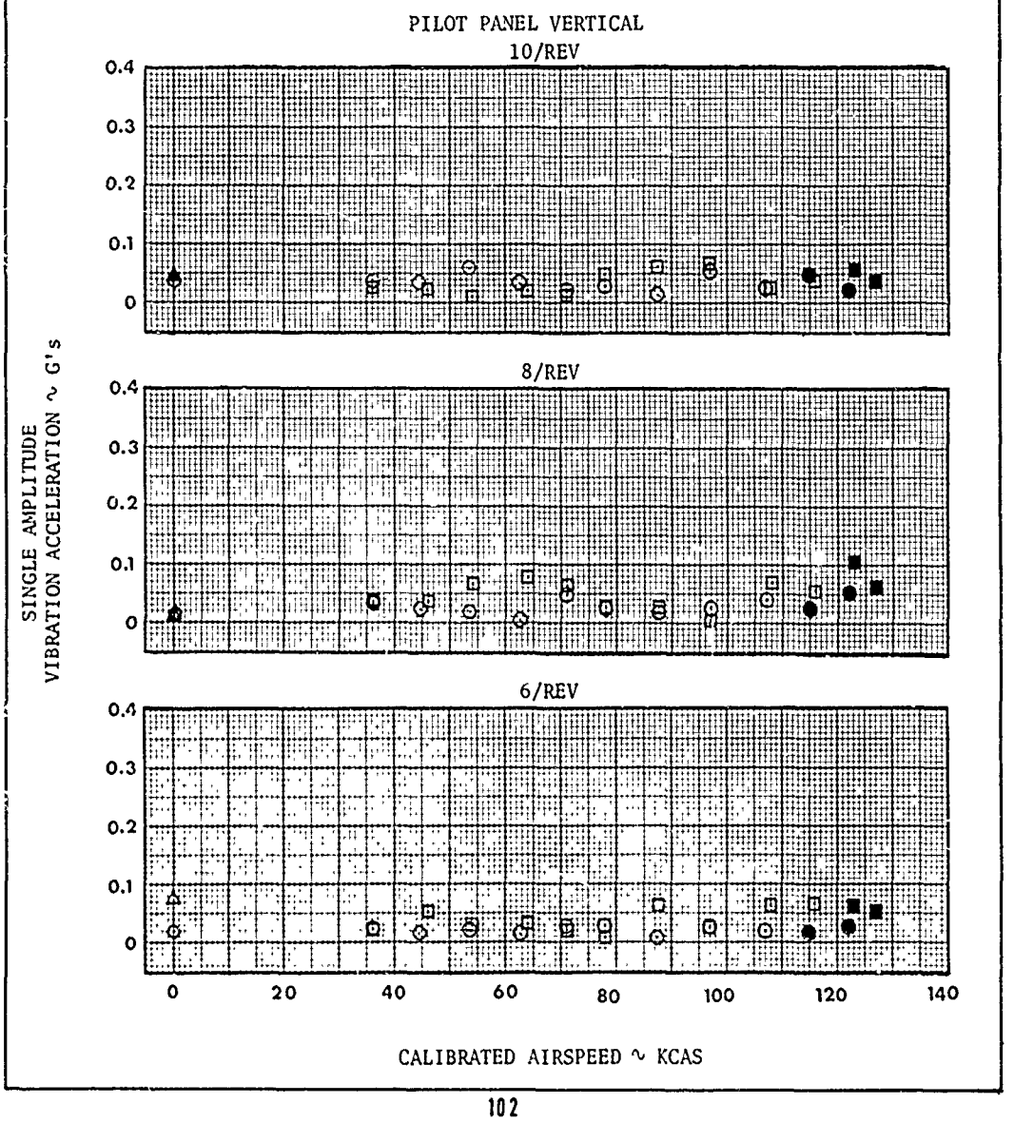


FIGURE 38
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

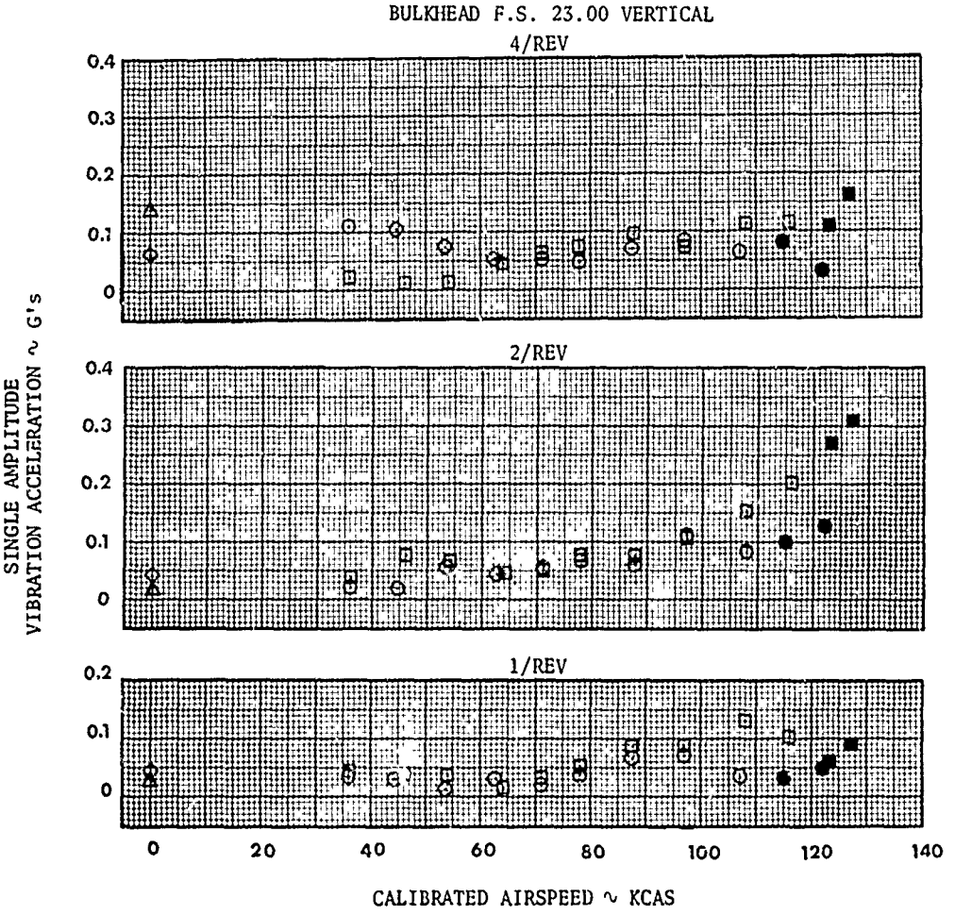


FIGURE 38 (CONTINUED)

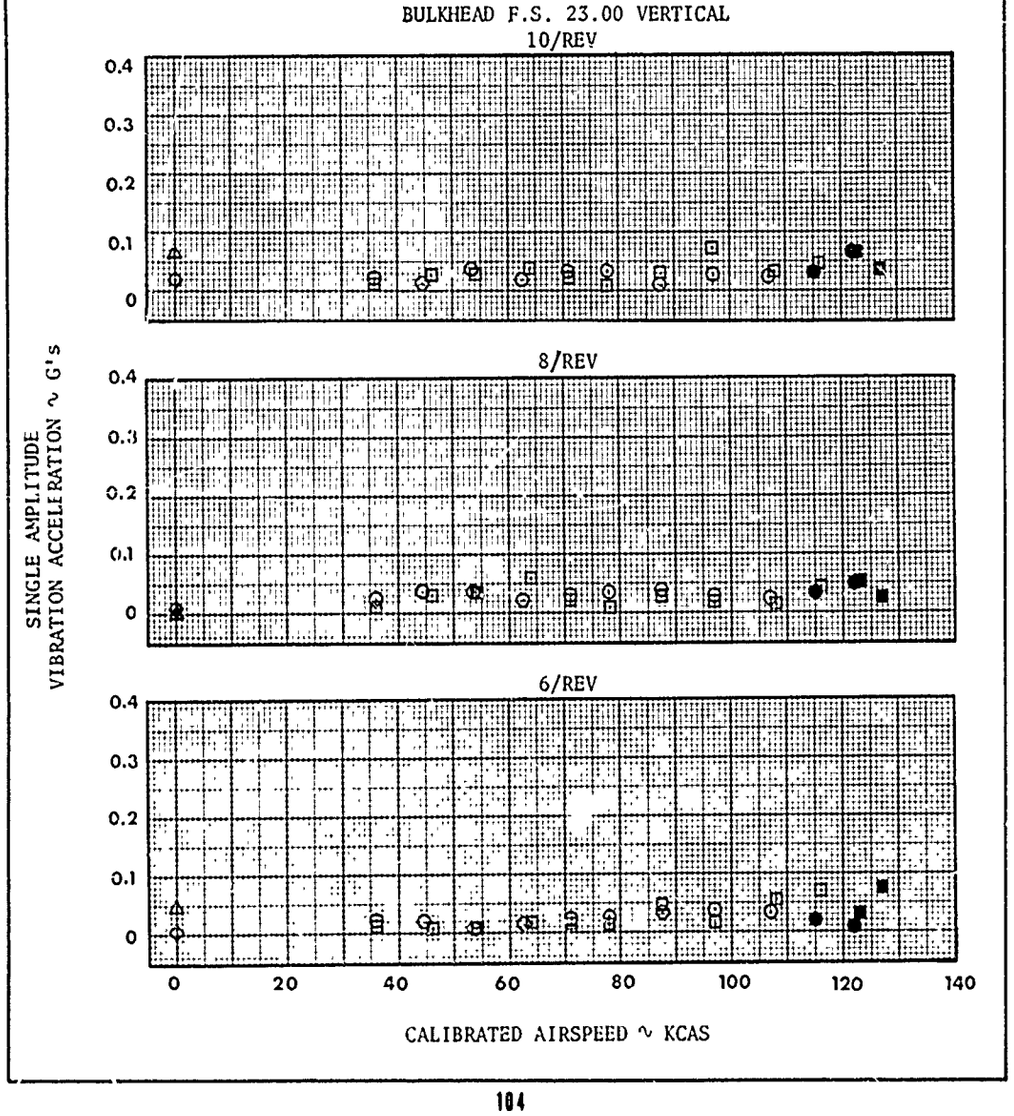


FIGURE 39
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

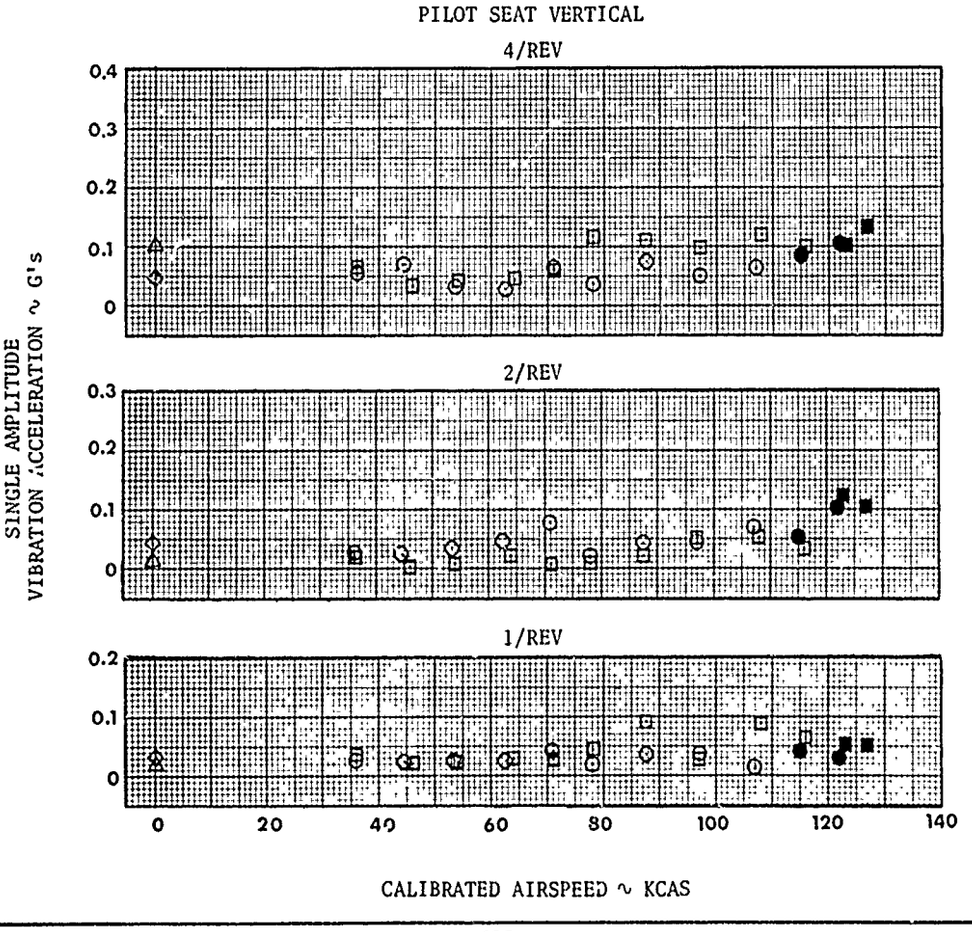


FIGURE 39 (CONTINUED)

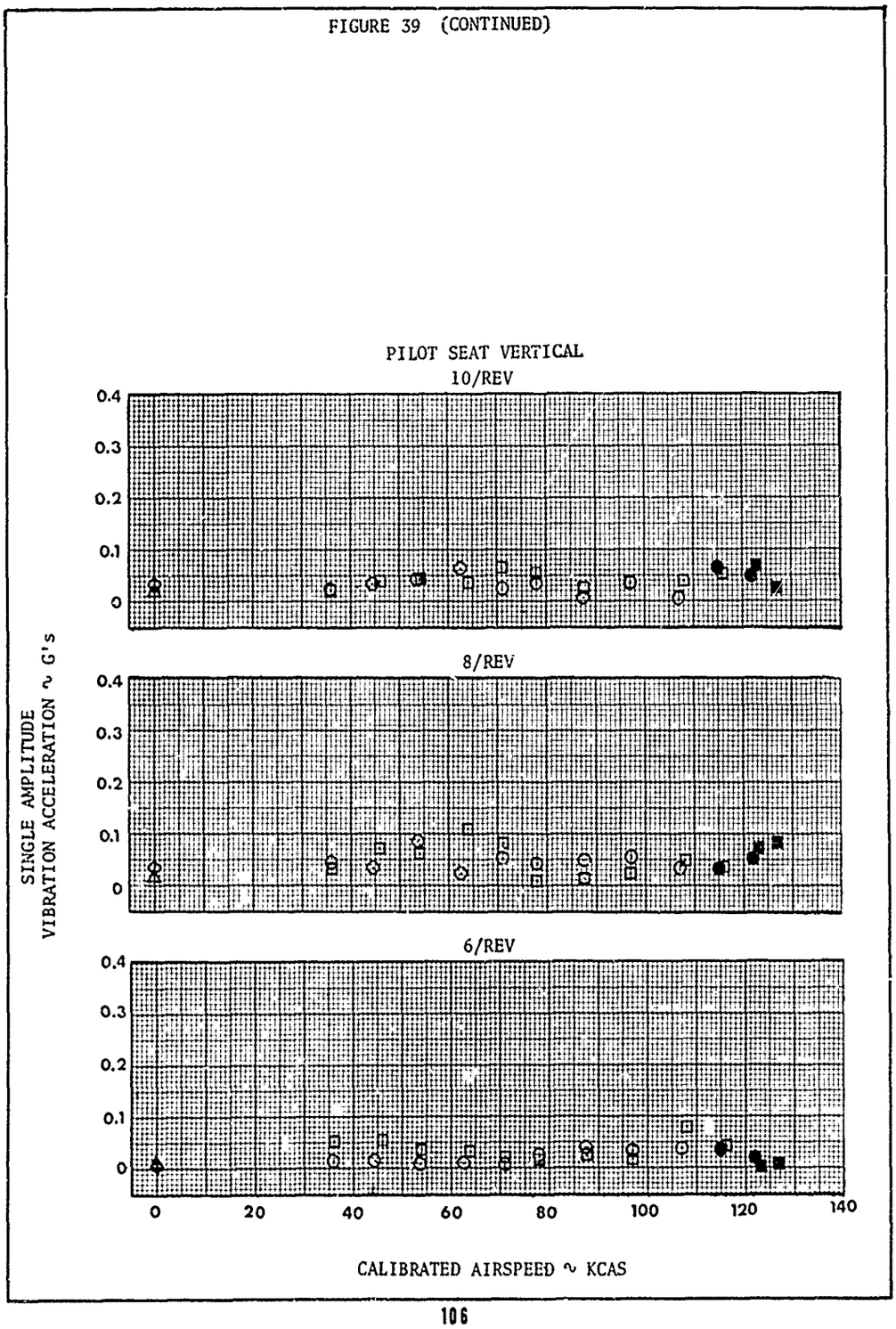


FIGURE 40

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

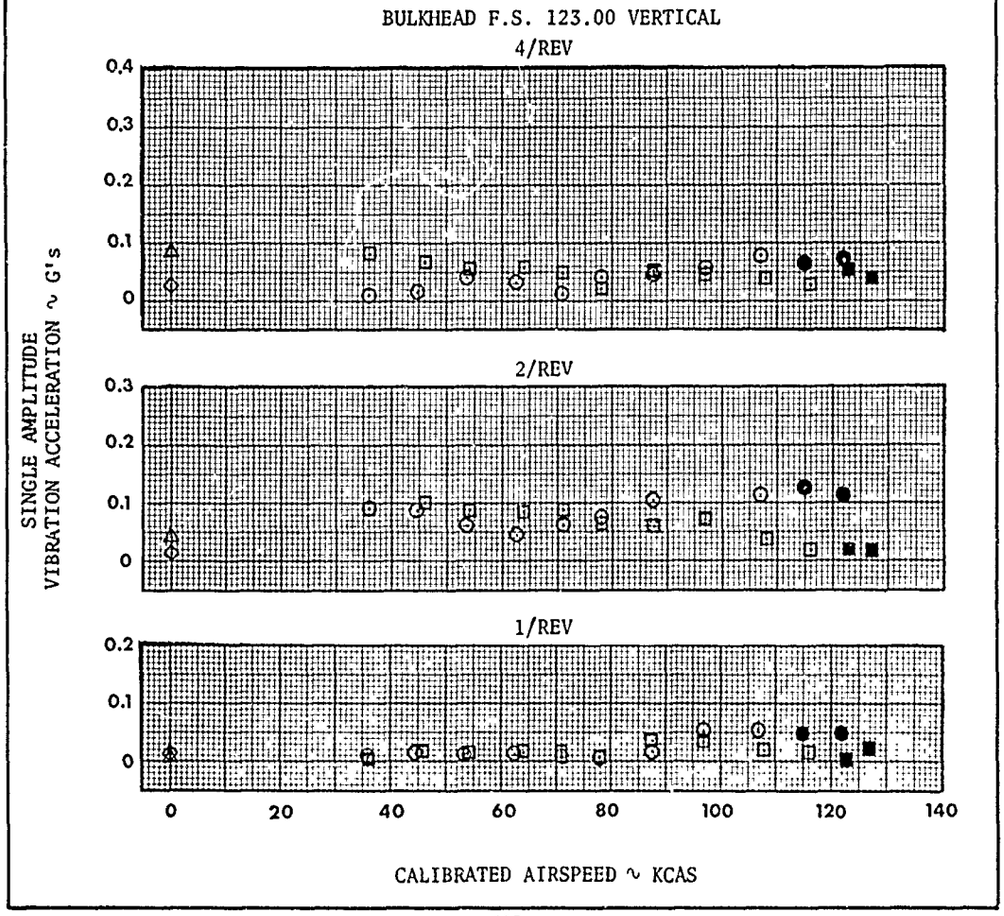


FIGURE 40 (CONTINUED)

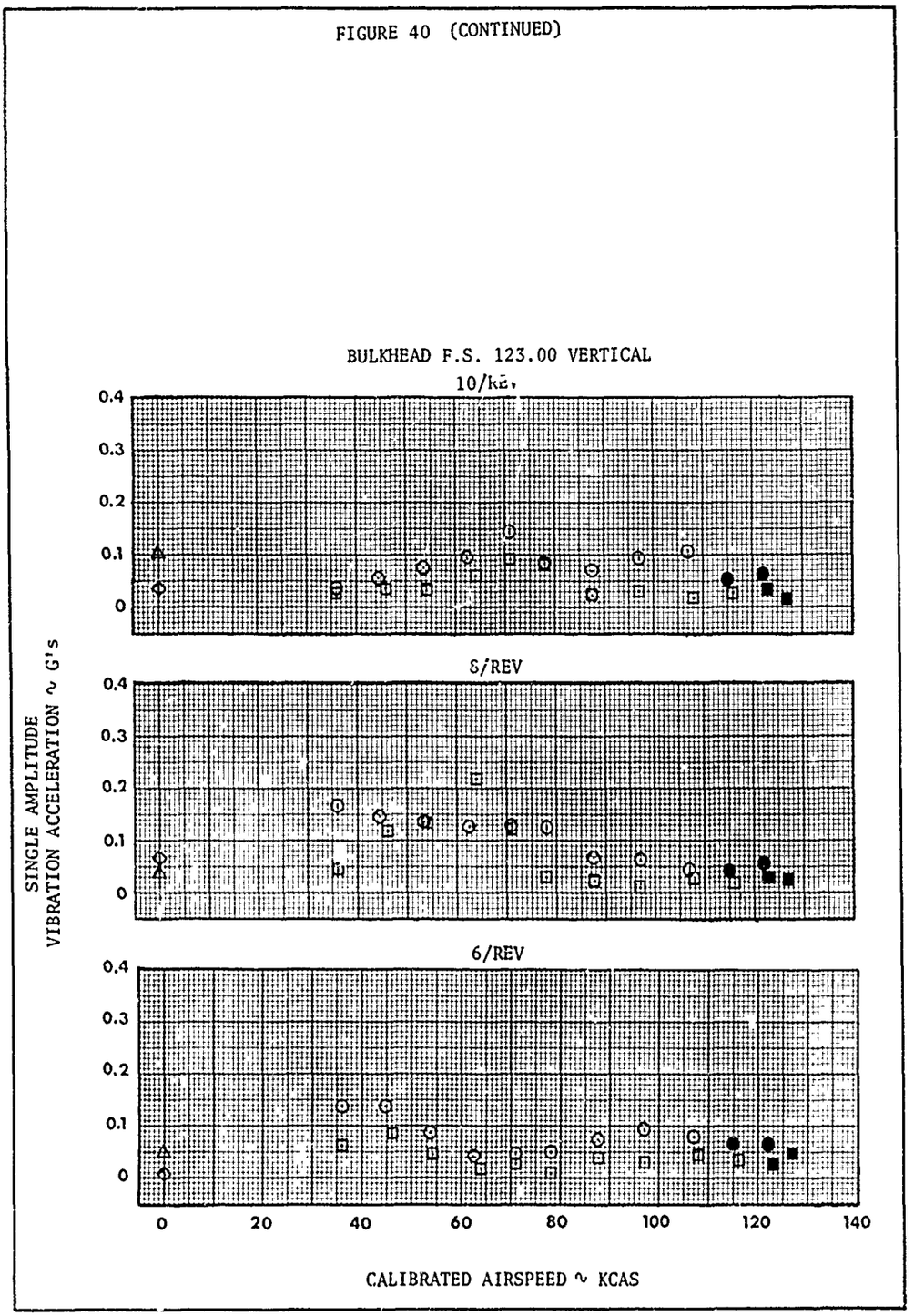


FIGURE 41

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

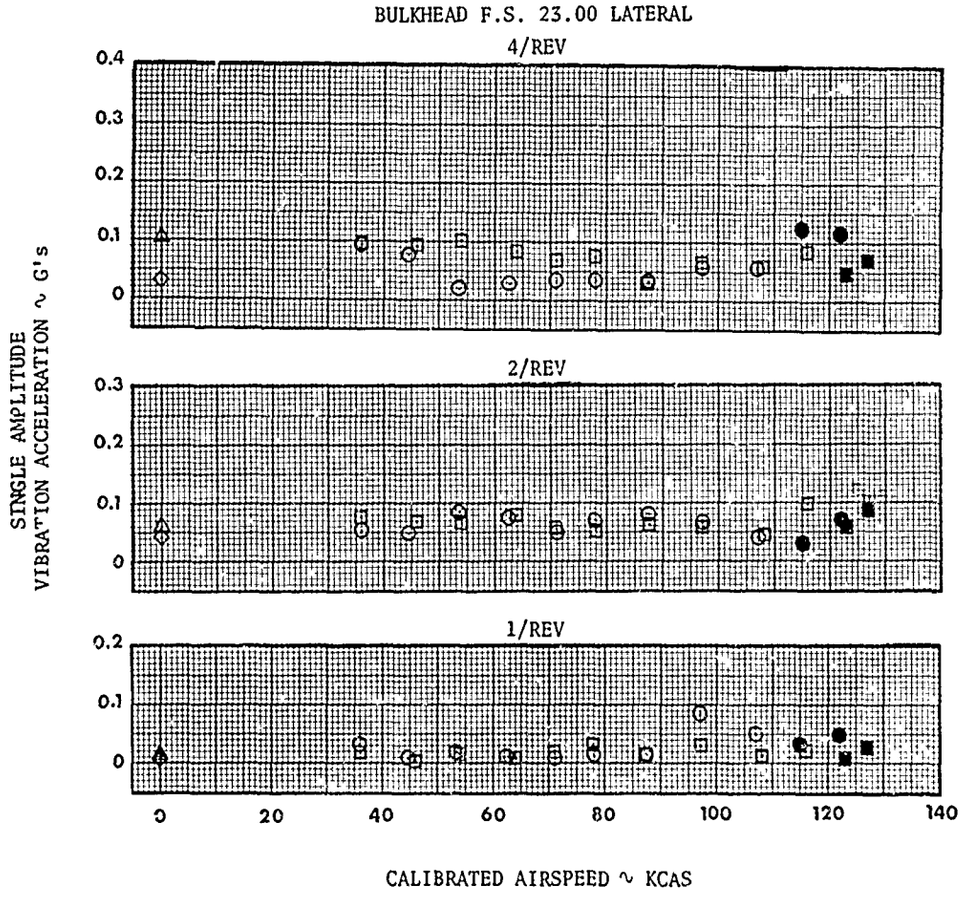


FIGURE 41 (CONTINUED)

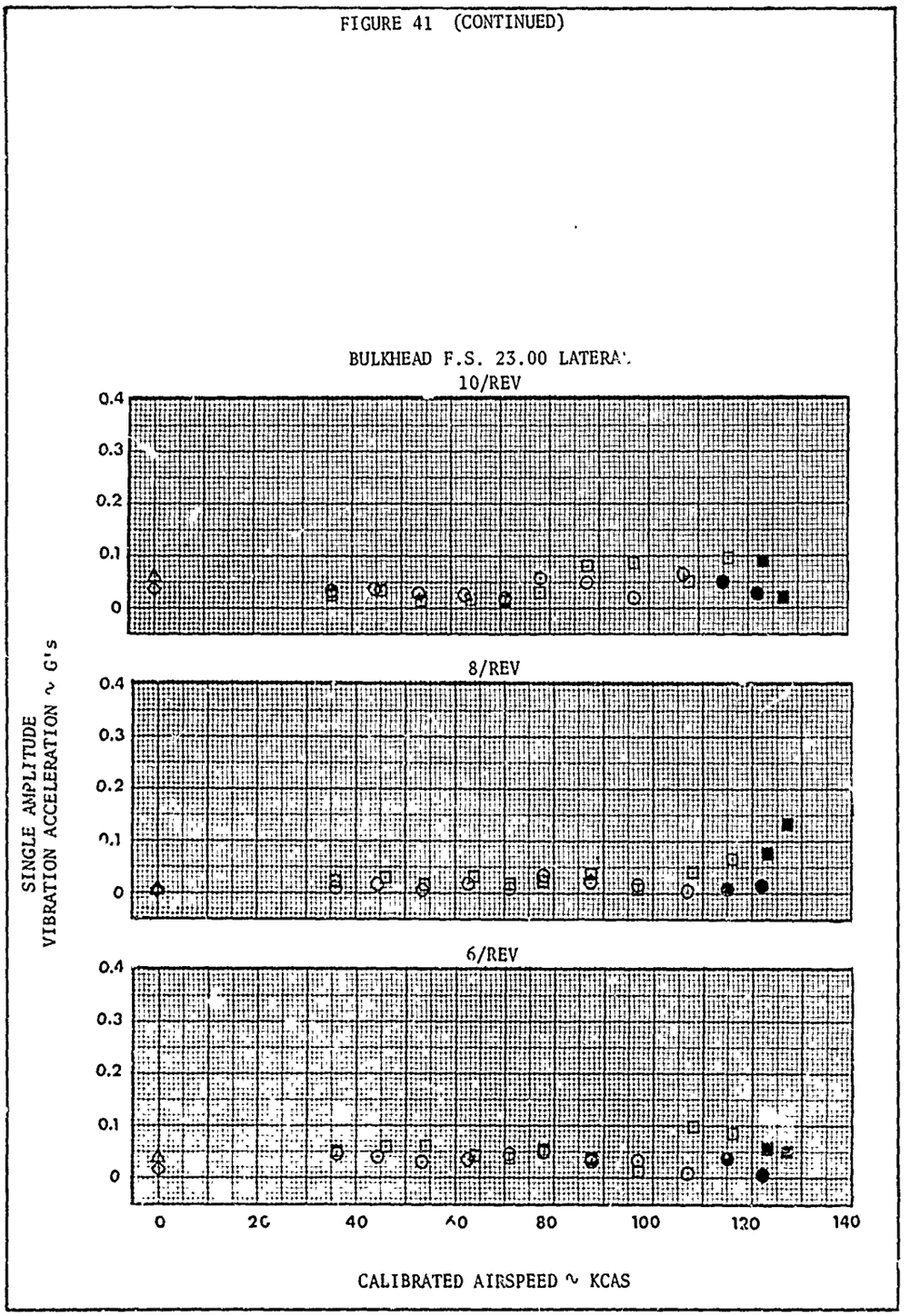


FIGURE 42
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

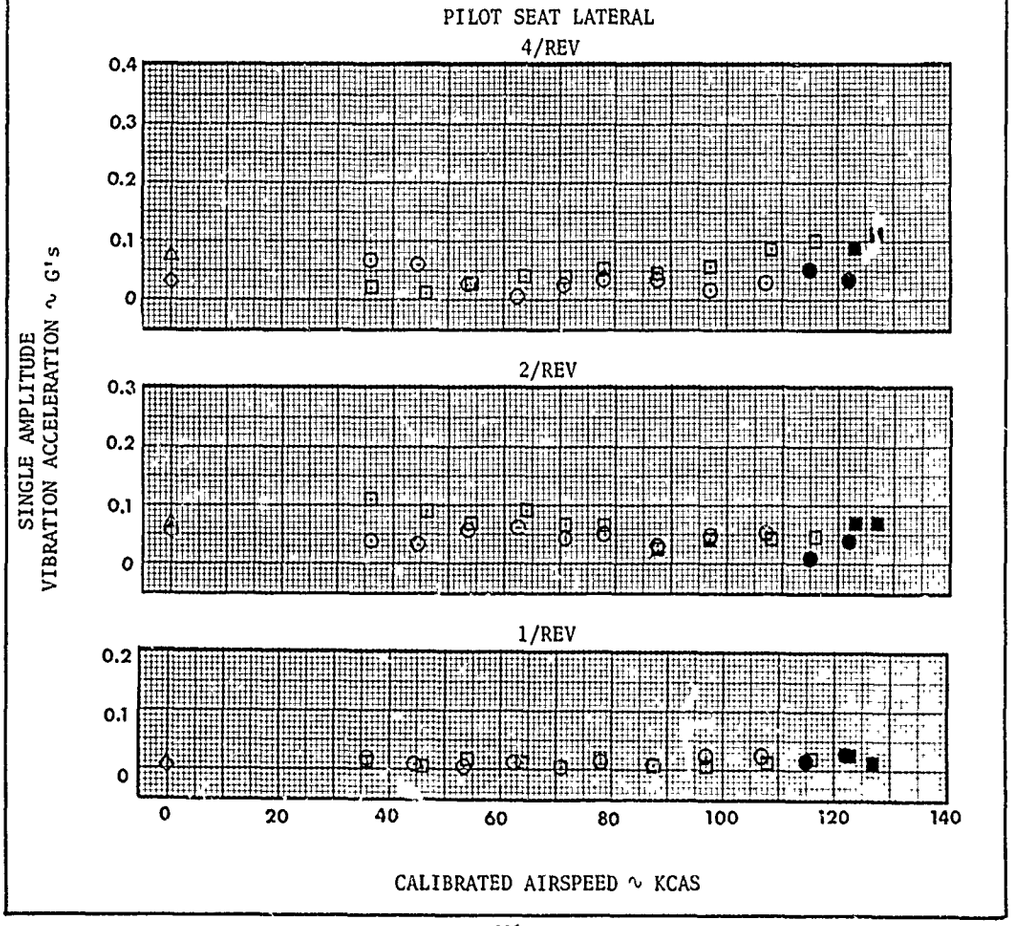


FIGURE 42 (CONTINUED)

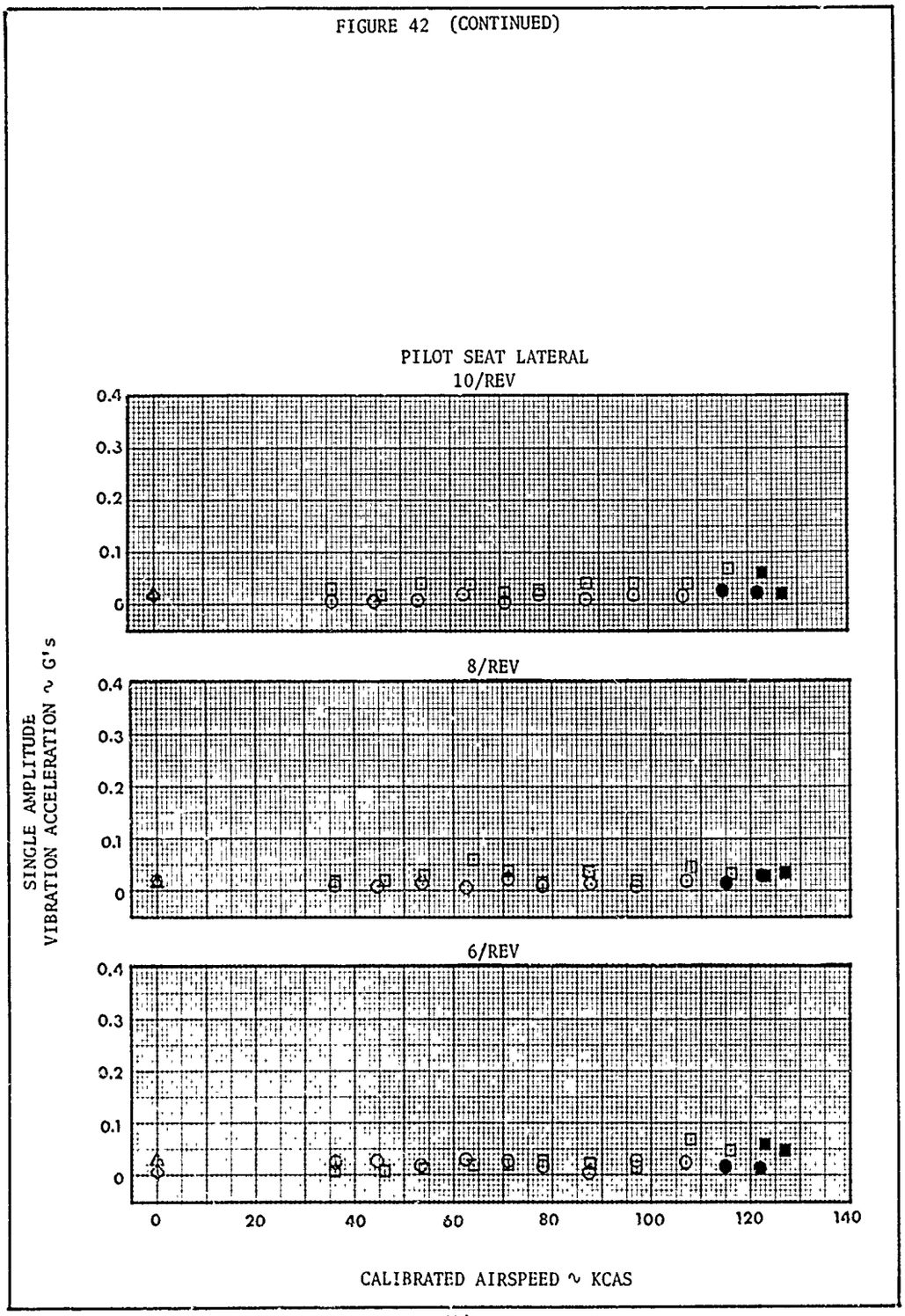


FIGURE 43
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

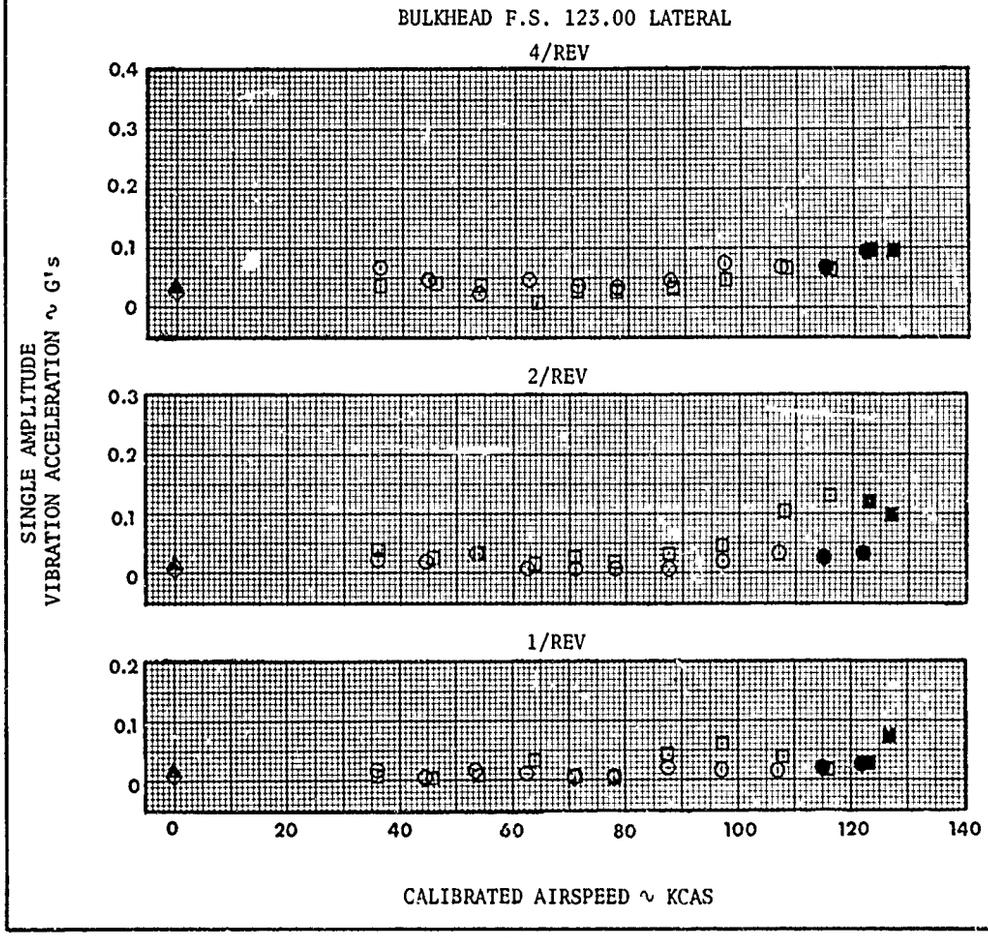


FIGURE 43 (CONTINUED)

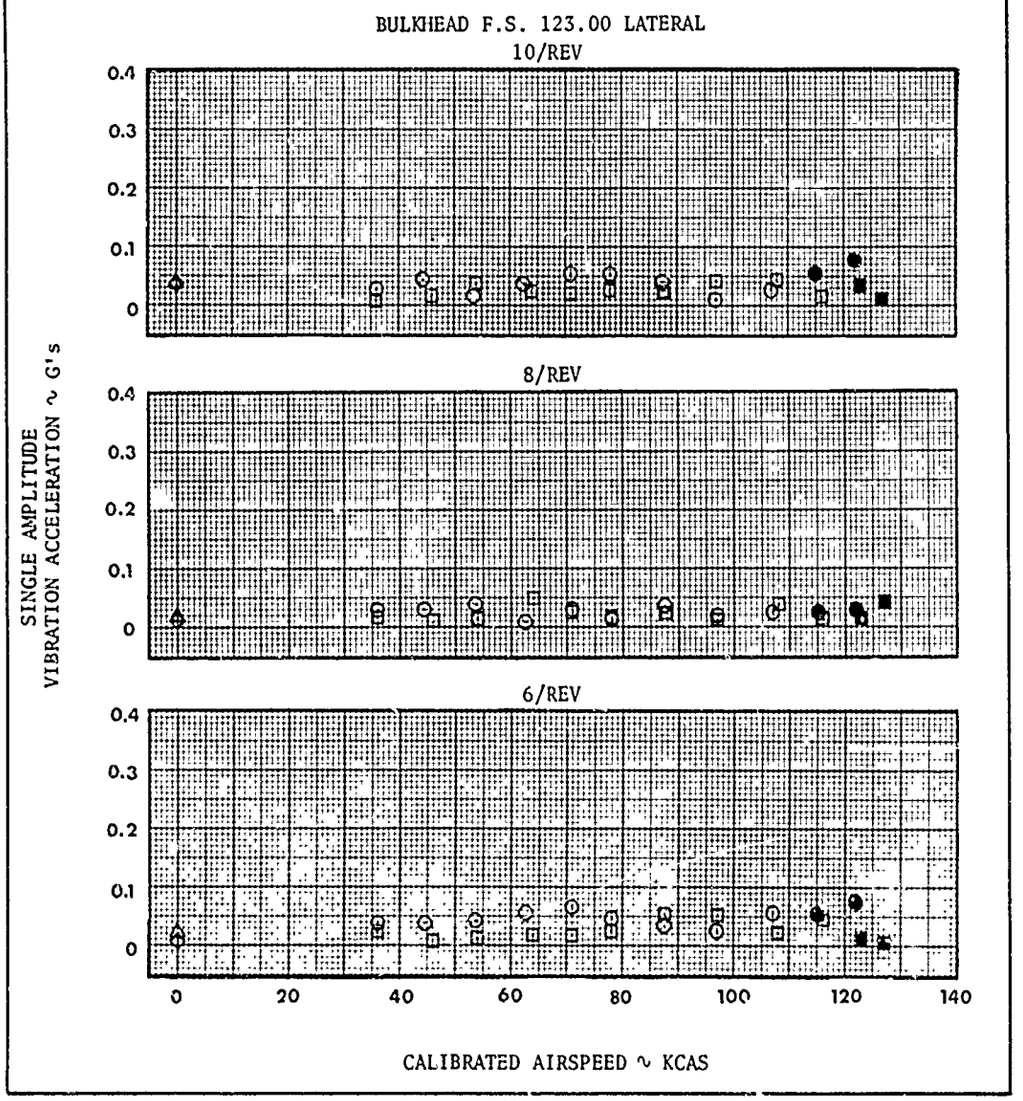


FIGURE 44
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

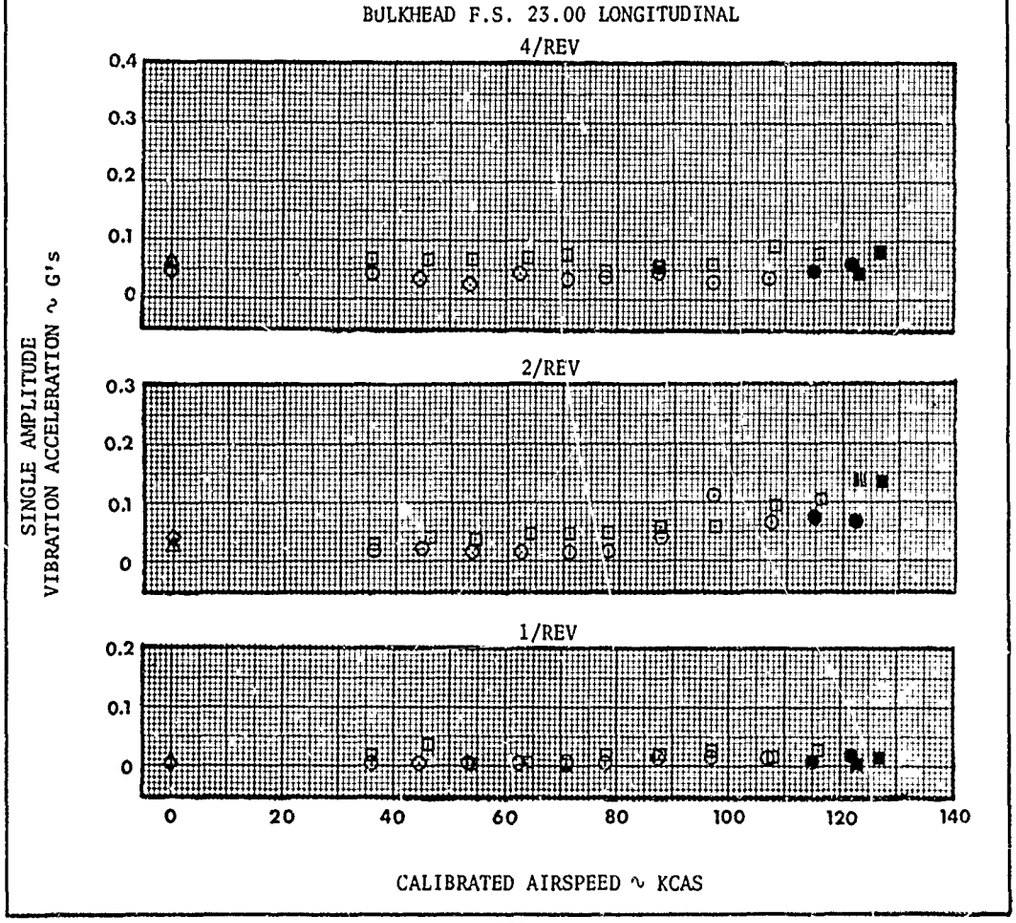


FIGURE 44 (CONTINUED)

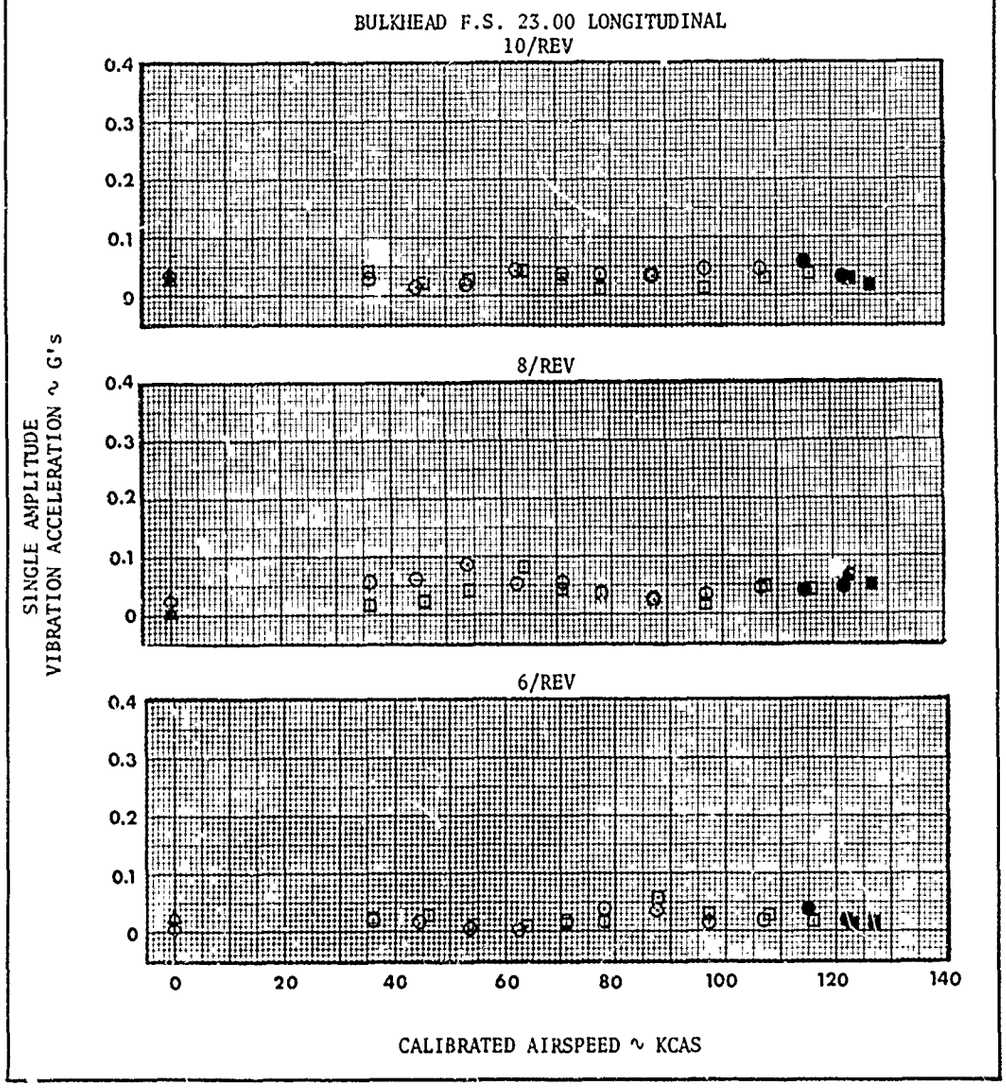


FIGURE 45

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	8300	1020	129 1	0.0	324	REMOVED	HOVERING FLT
□	8120	2370	128.9	0.0	322	REMOVED	LEVEL FLT
■	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
◆	8320	1450	128.7	0.3 RT	320	INSTALL	HOVERING FLT
○	8160	2340	128.6	0.3 RT	322	INSTALL	LEVEL FLT
●	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT

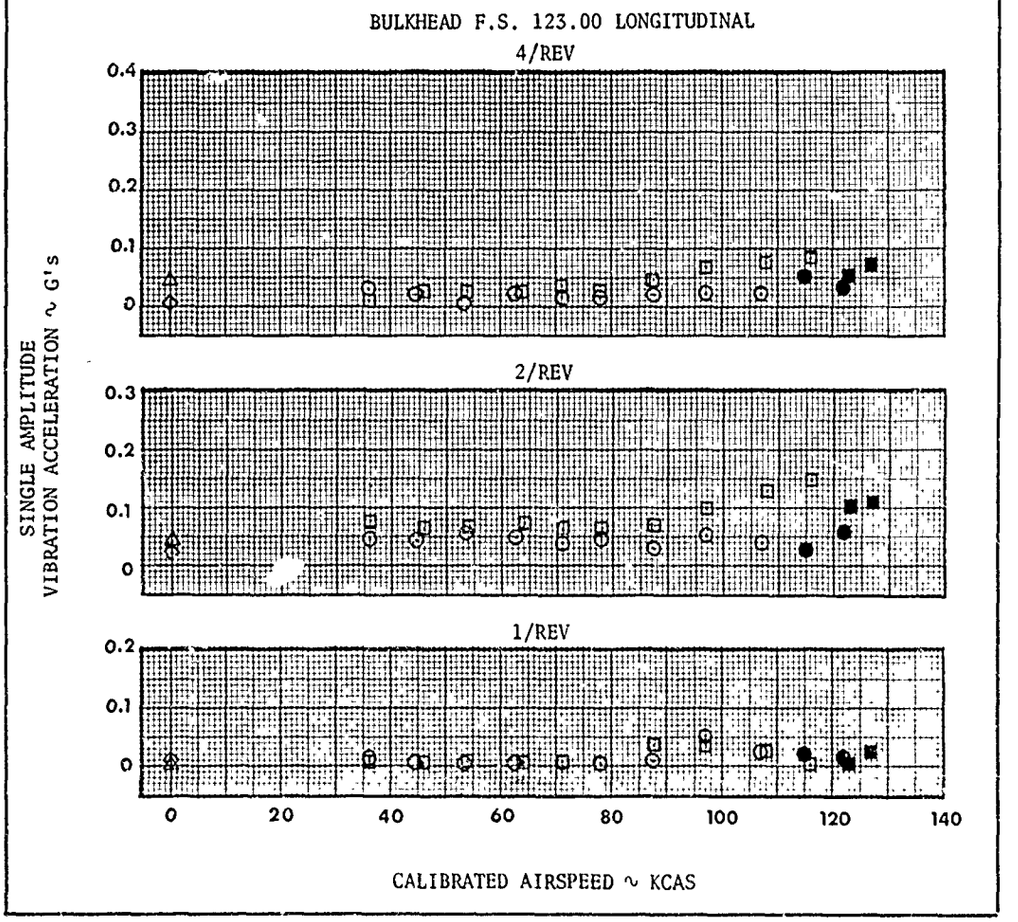


FIGURE 45 (CONTINUED)

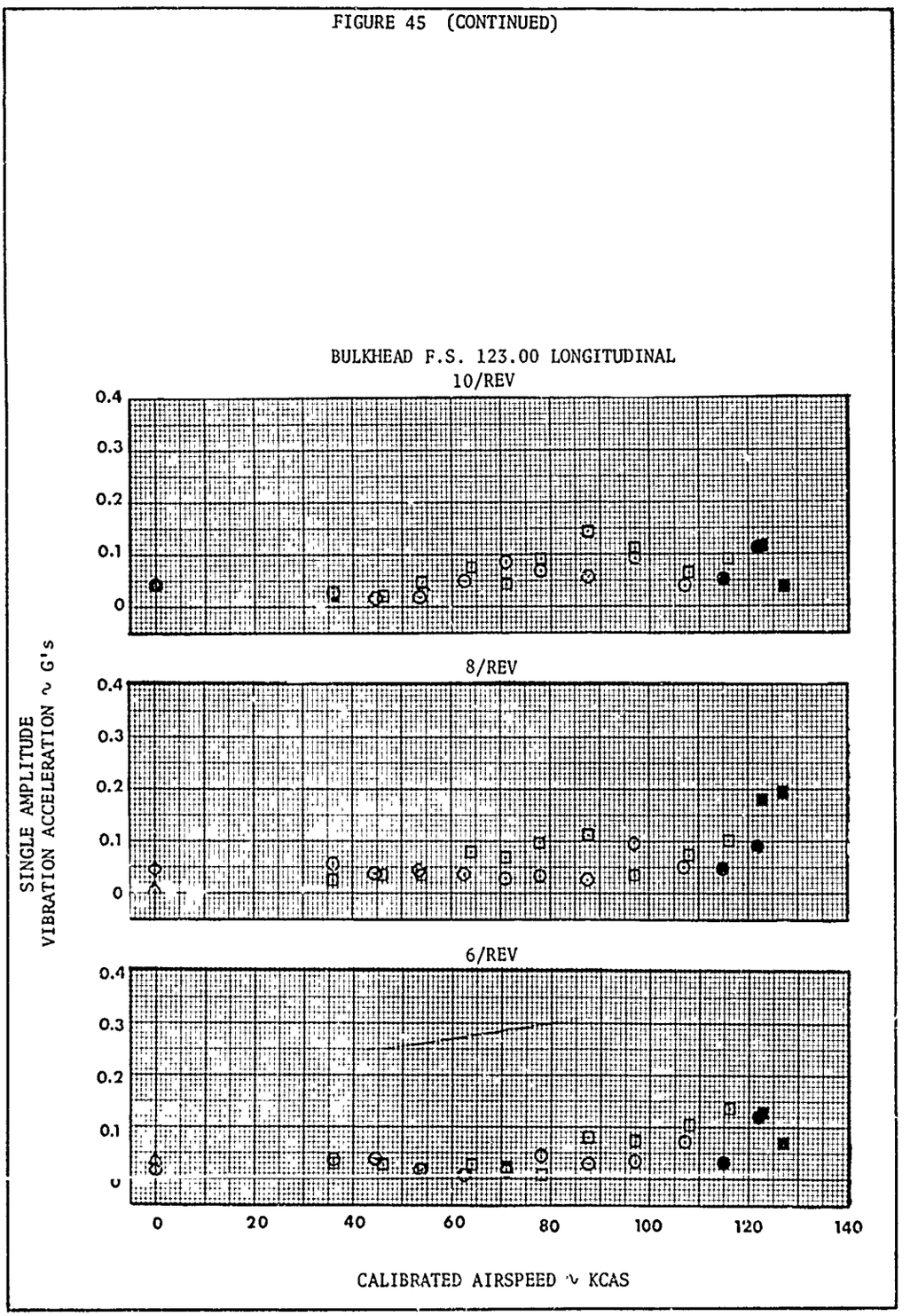


FIGURE 46
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

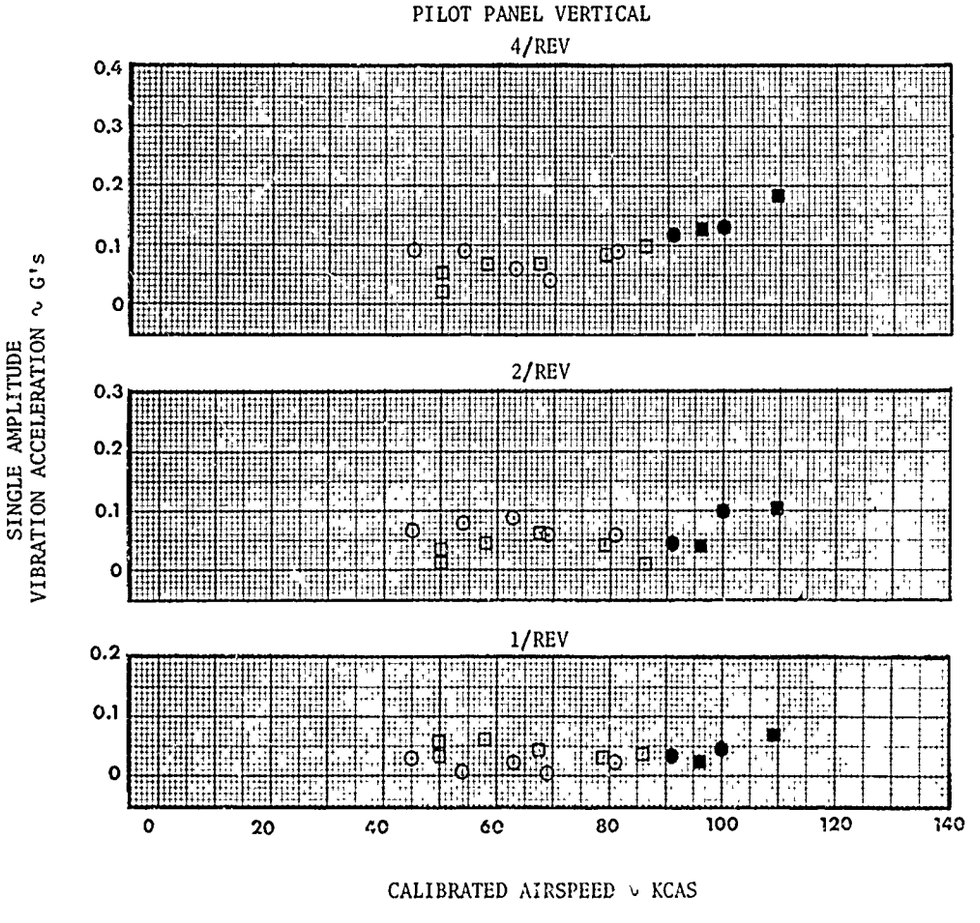


FIGURE 46 (CONTINUED)

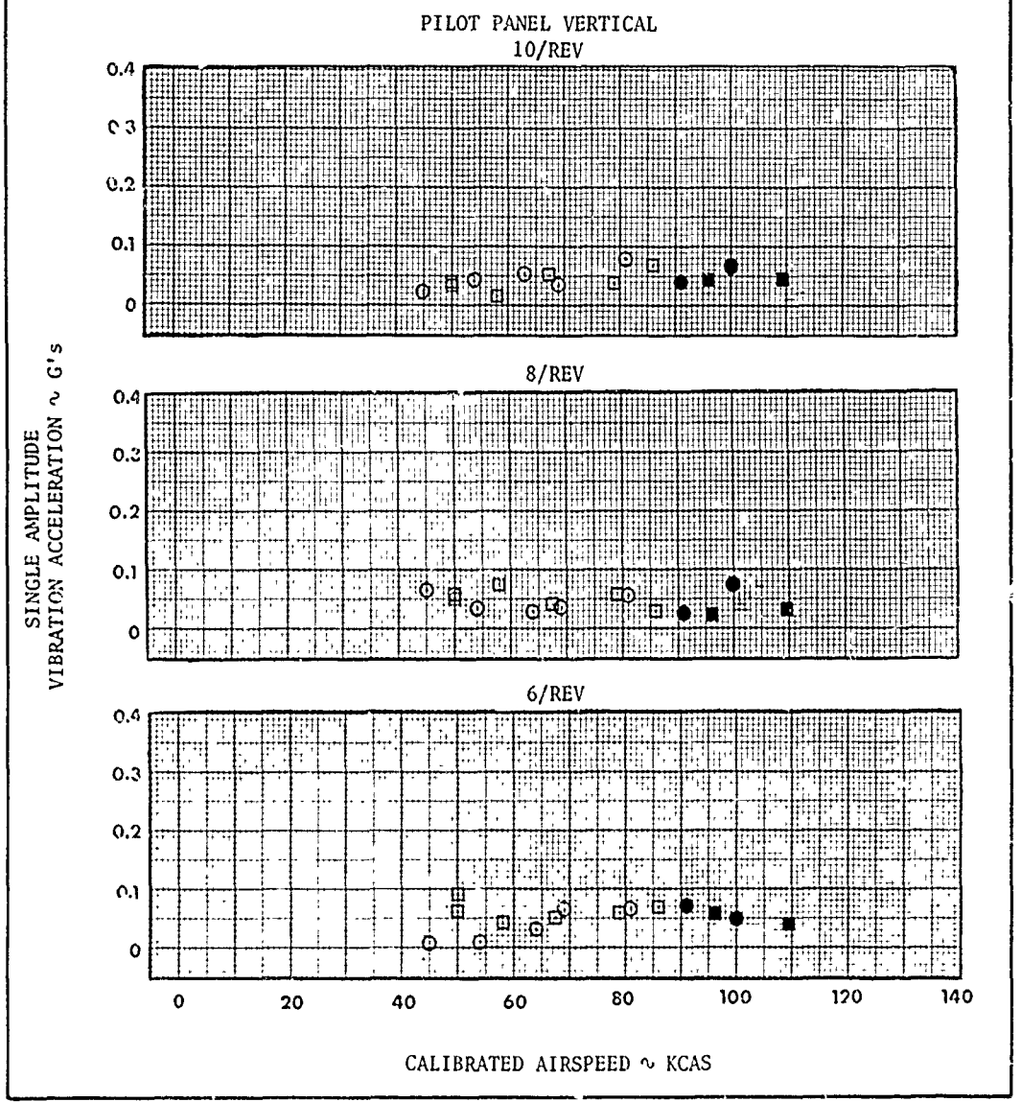


FIGURE 47

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

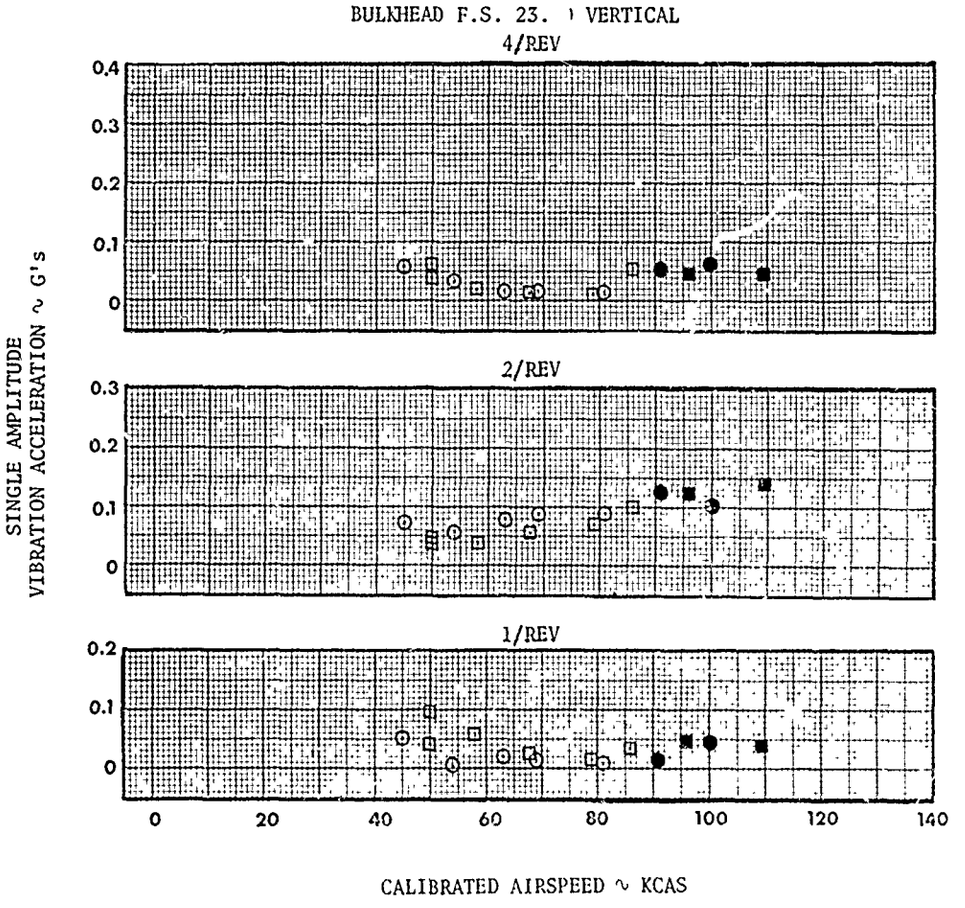


FIGURE 47 (CONTINUED)

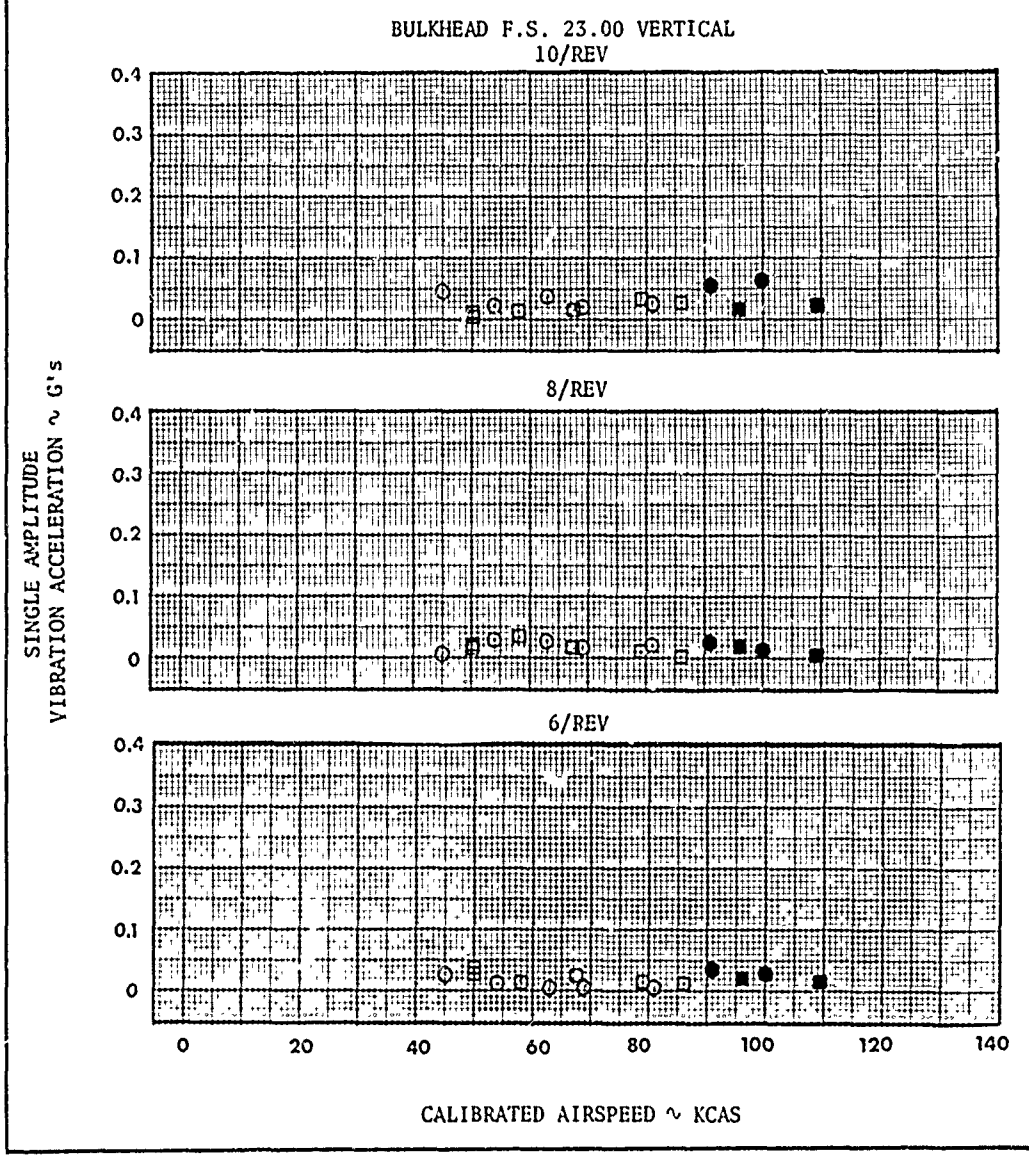


FIGURE 48
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

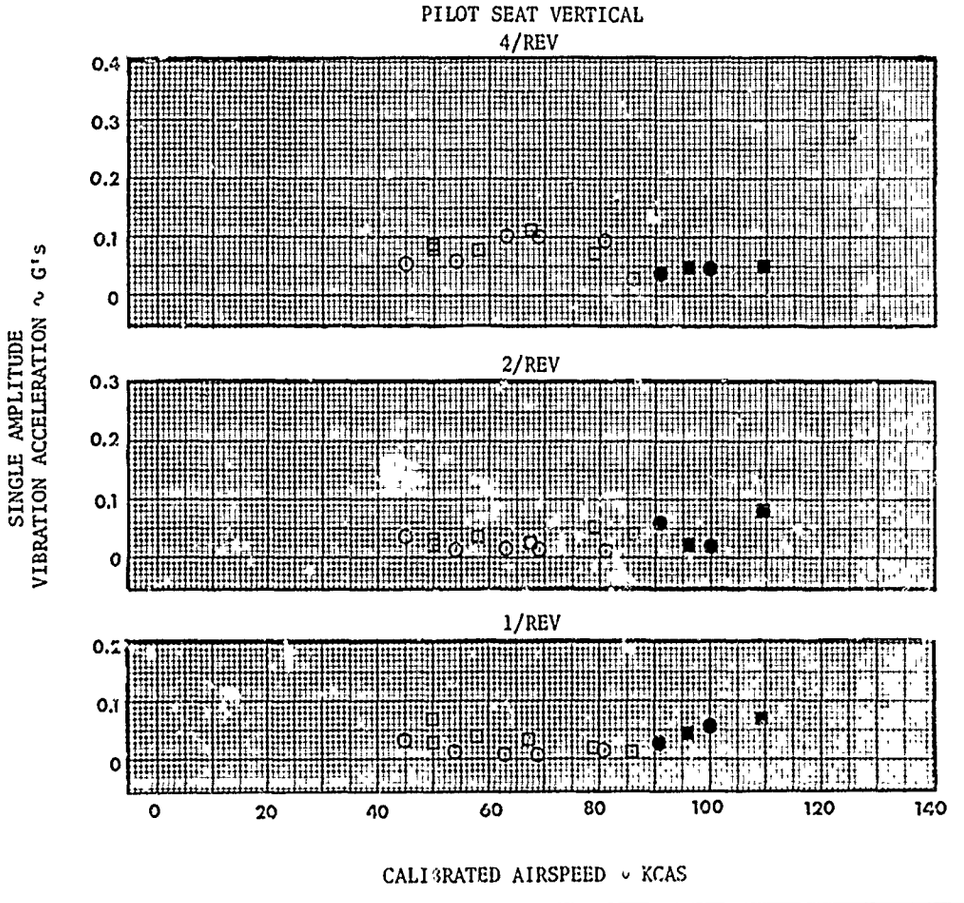


FIGURE 48 (CONTINUED)

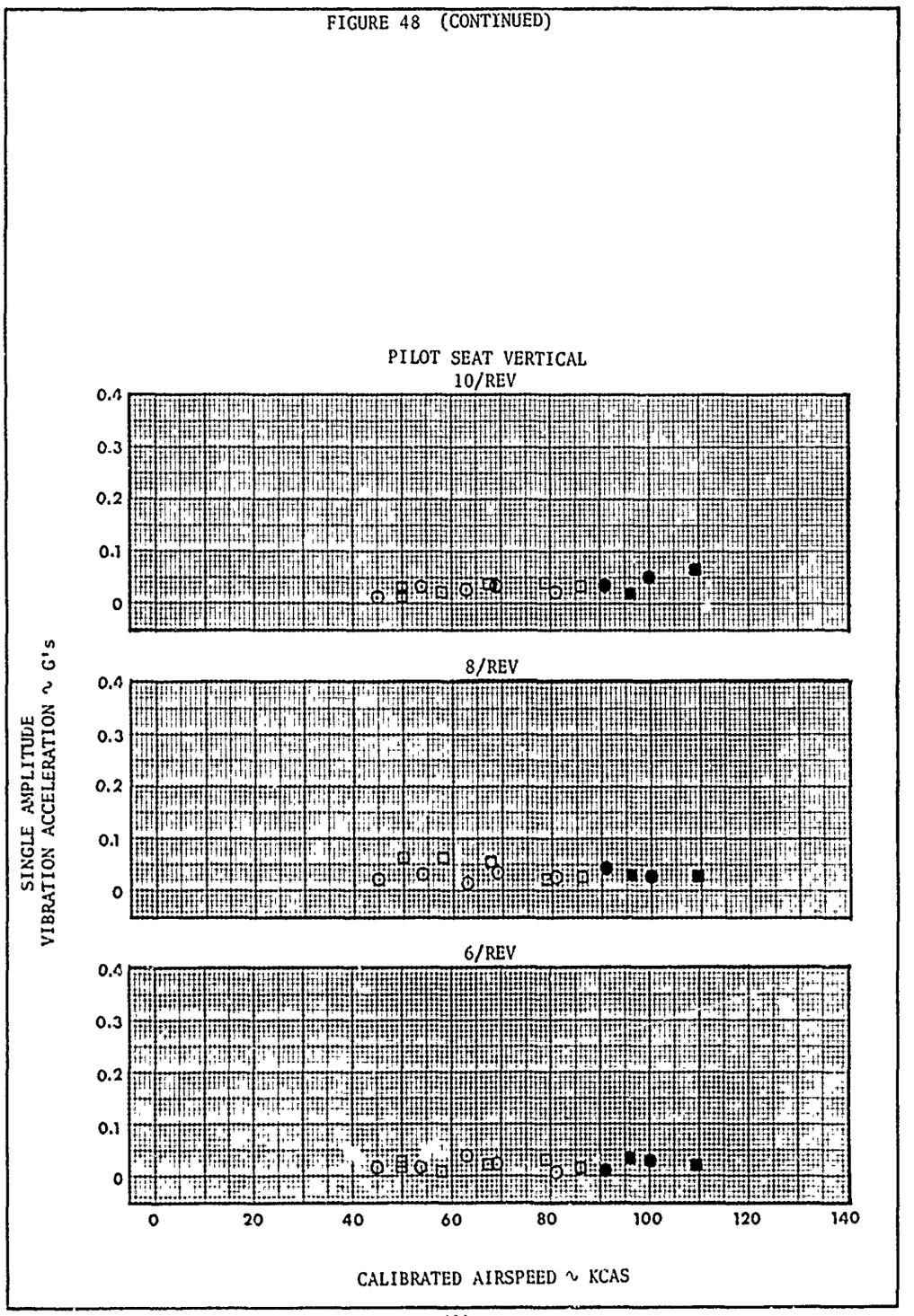


FIGURE 49
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

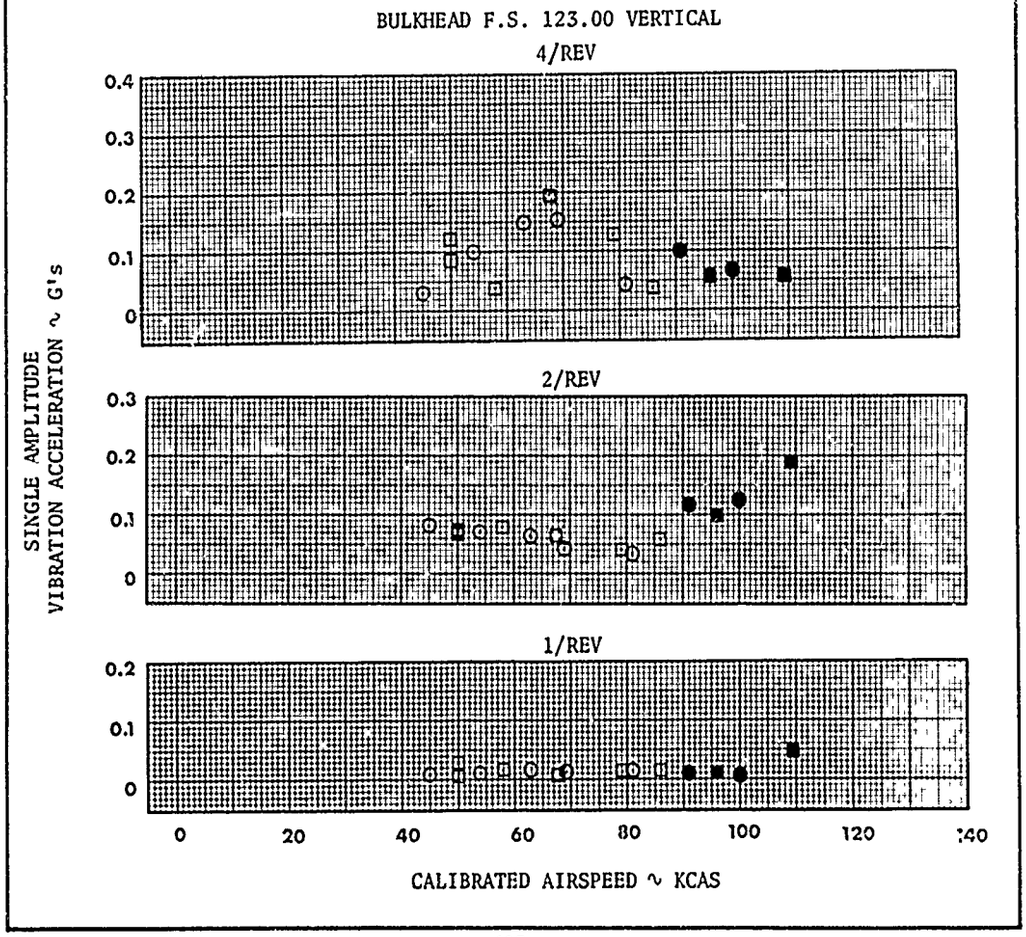


FIGURE 49 (CONTINUED)

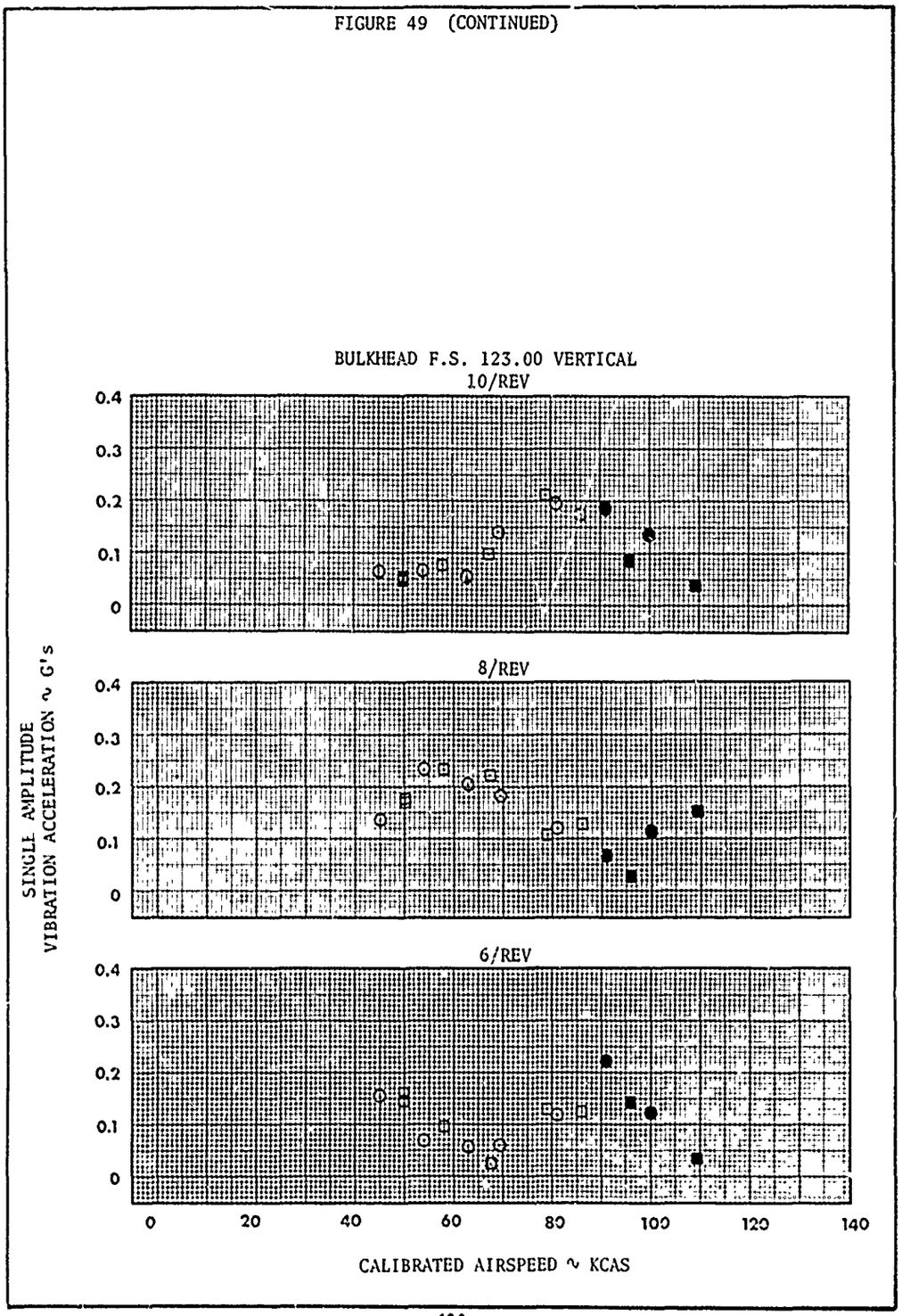


FIGURE 50

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

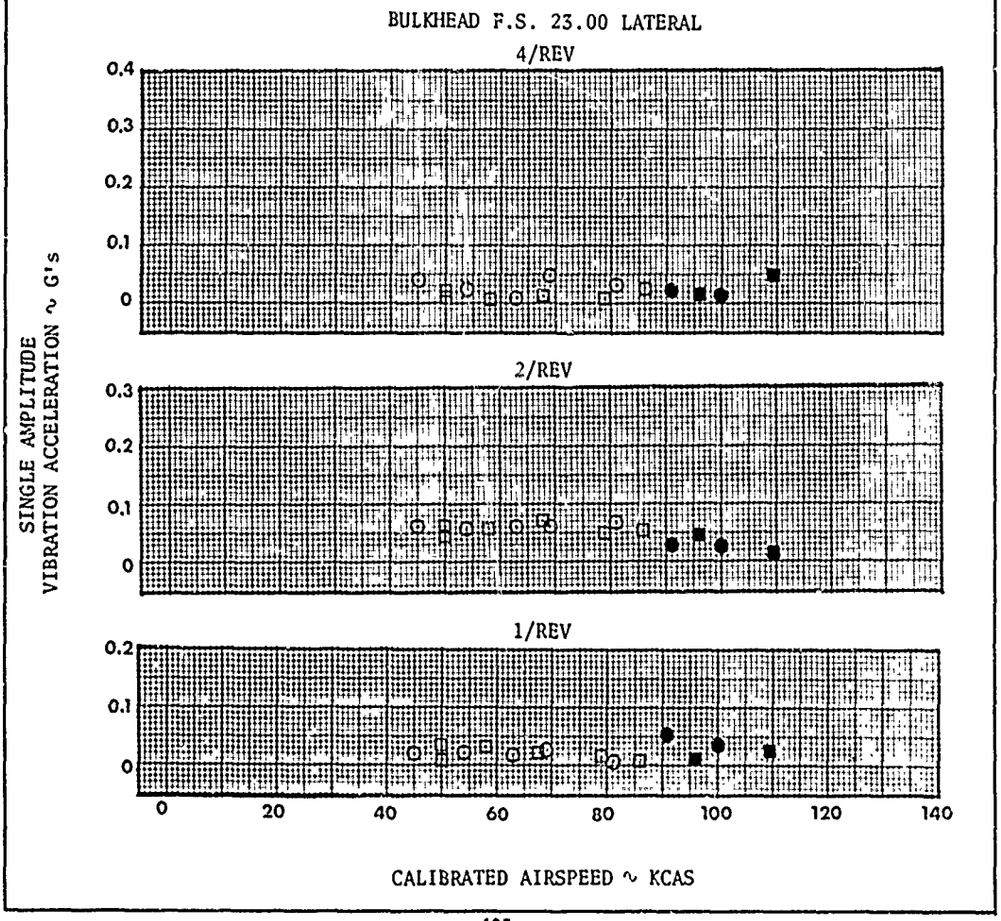


FIGURE 50 (CONTINUED)

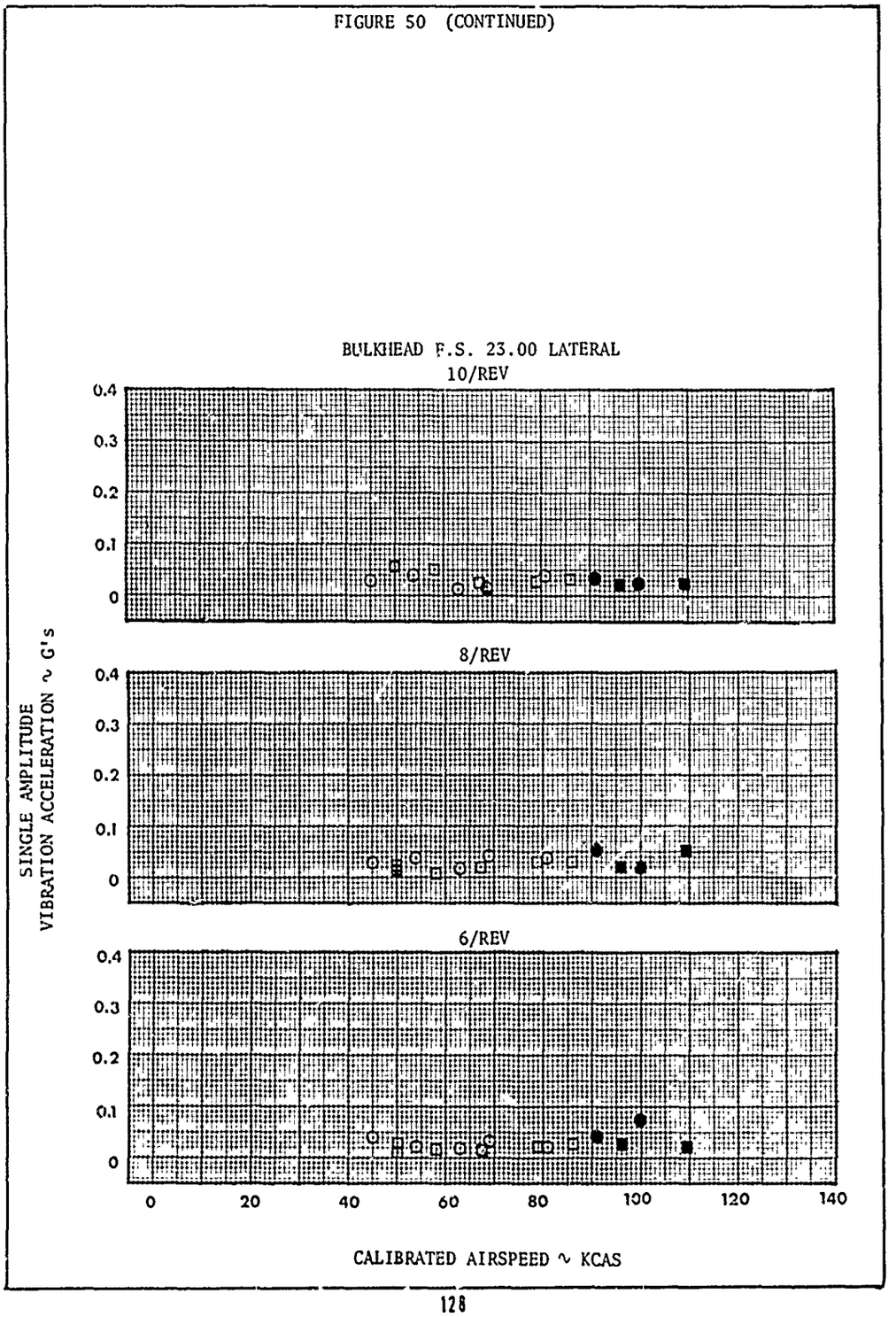


FIGURE 51

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

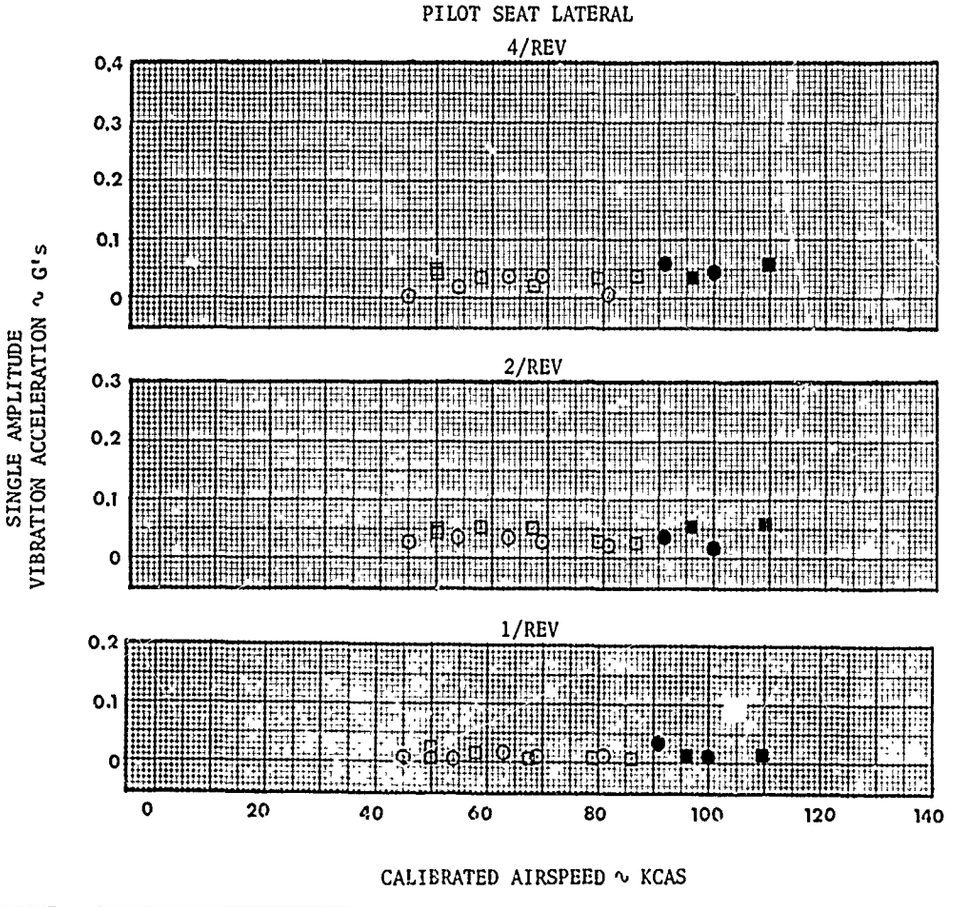


FIGURE 51 (CONTINUED)

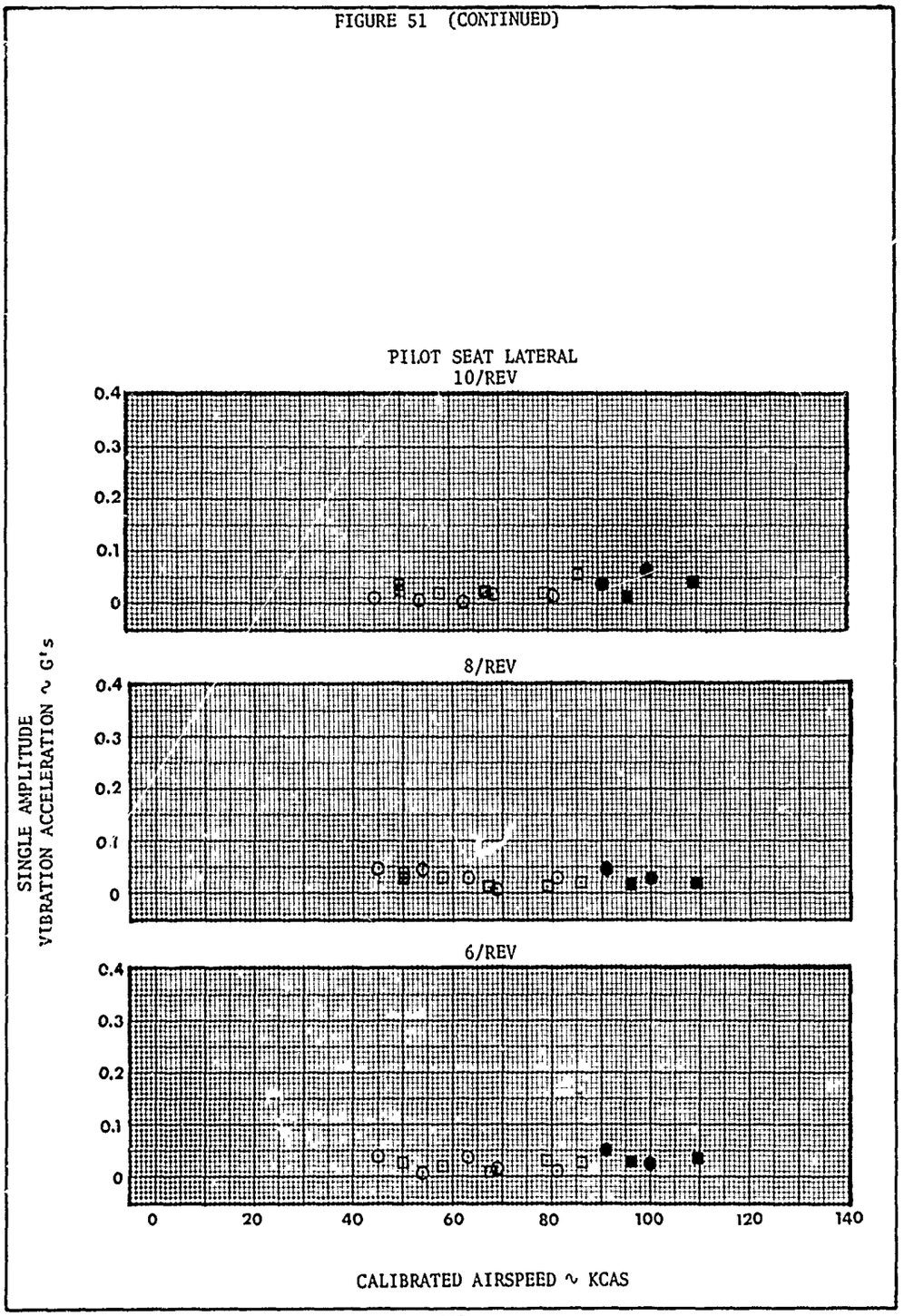


FIGURE 52
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

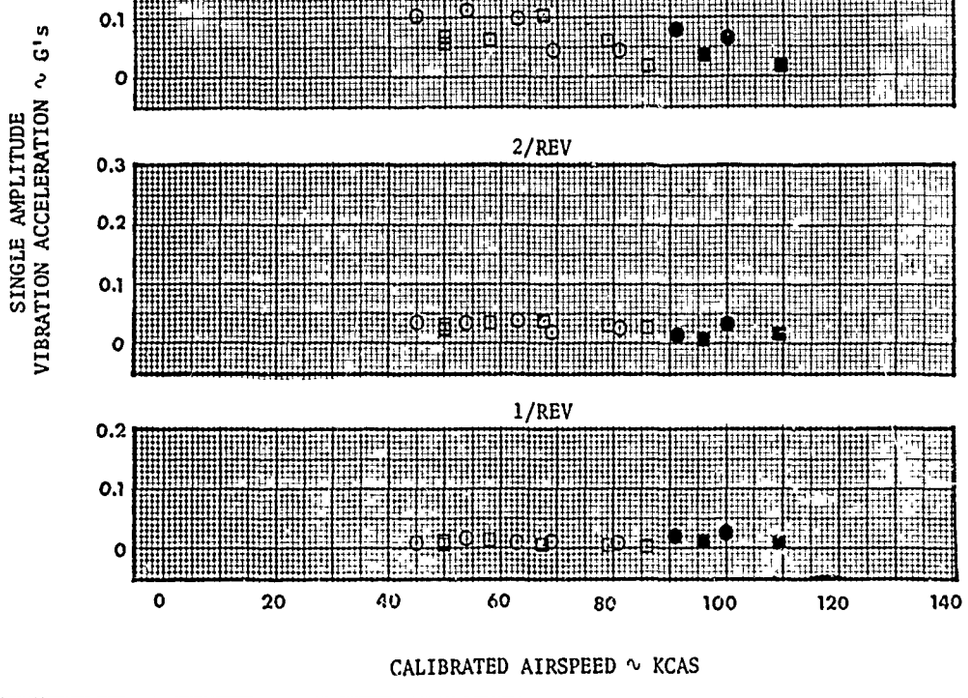


FIGURE 52 (CONTINUED)

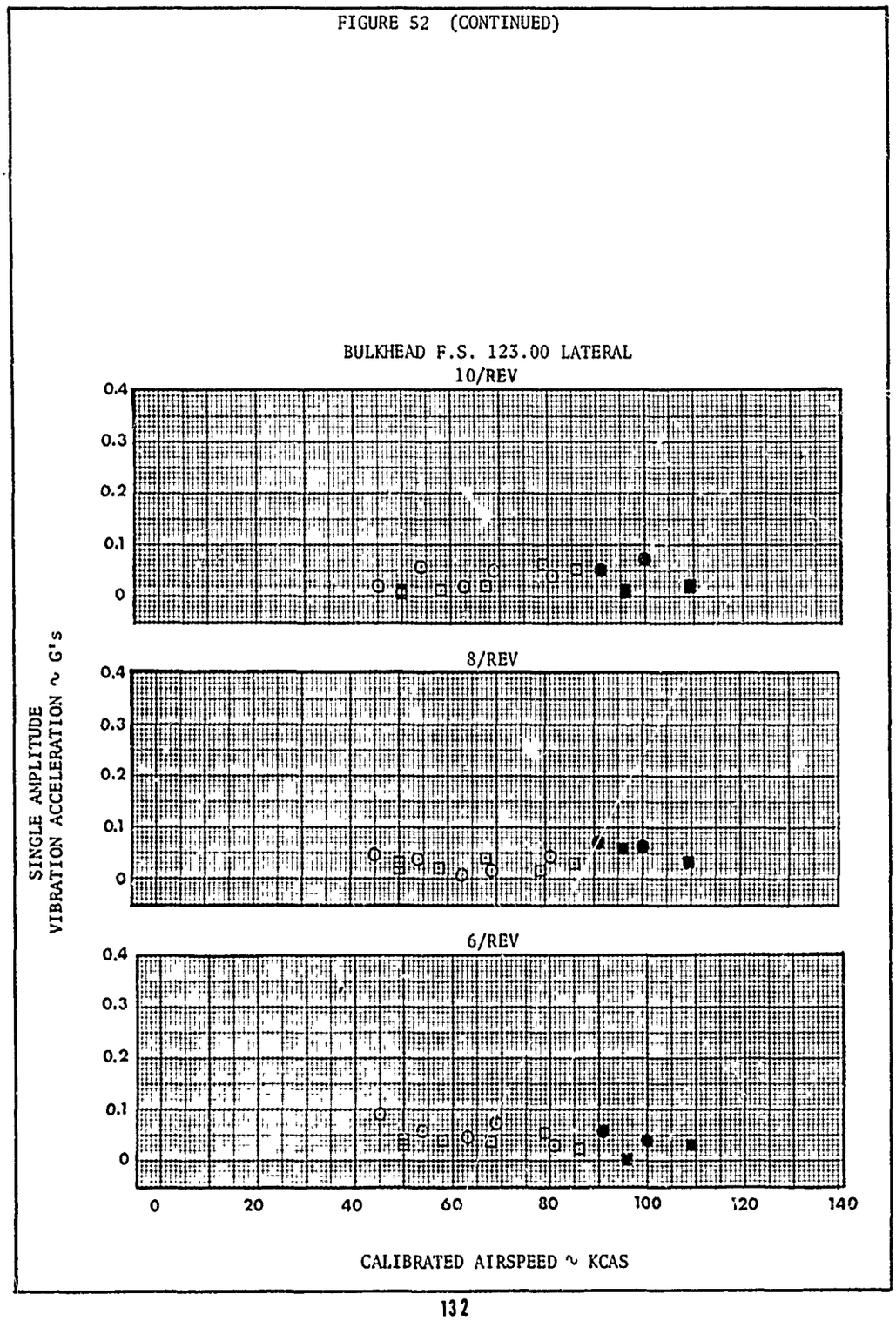


FIGURE 53
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

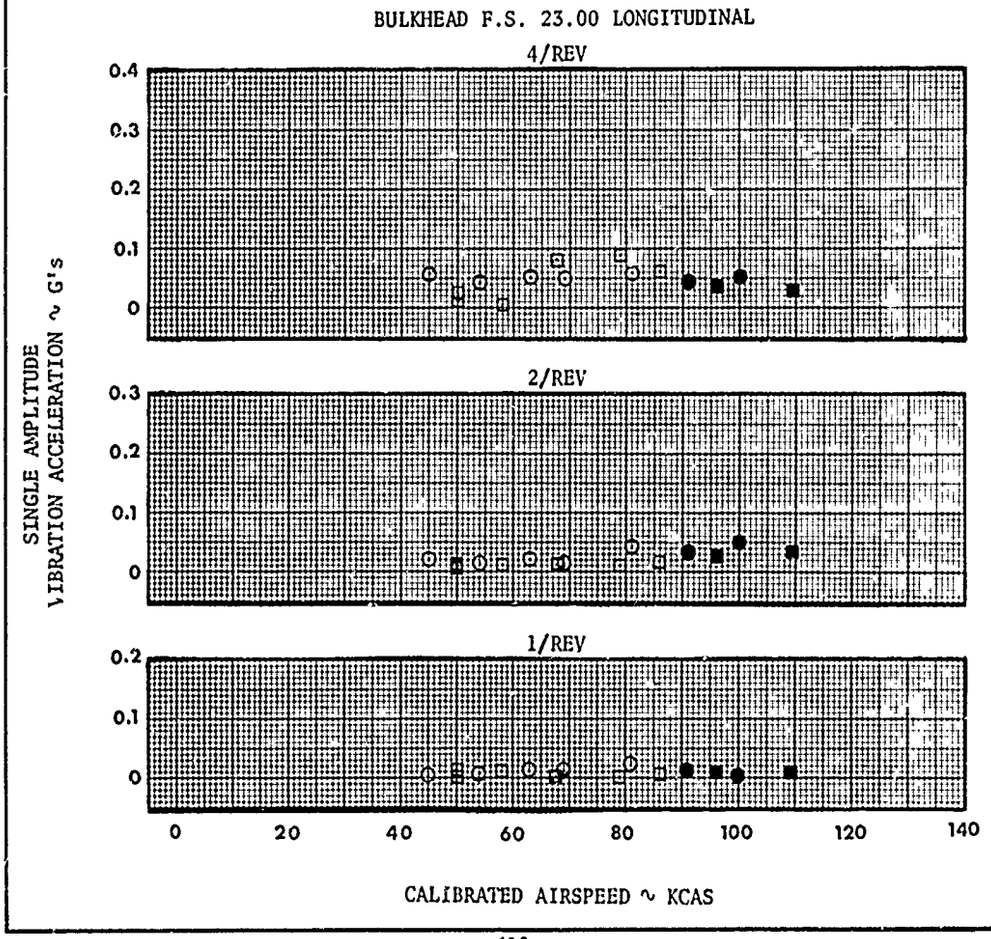


FIGURE 53 (CONTINUED)

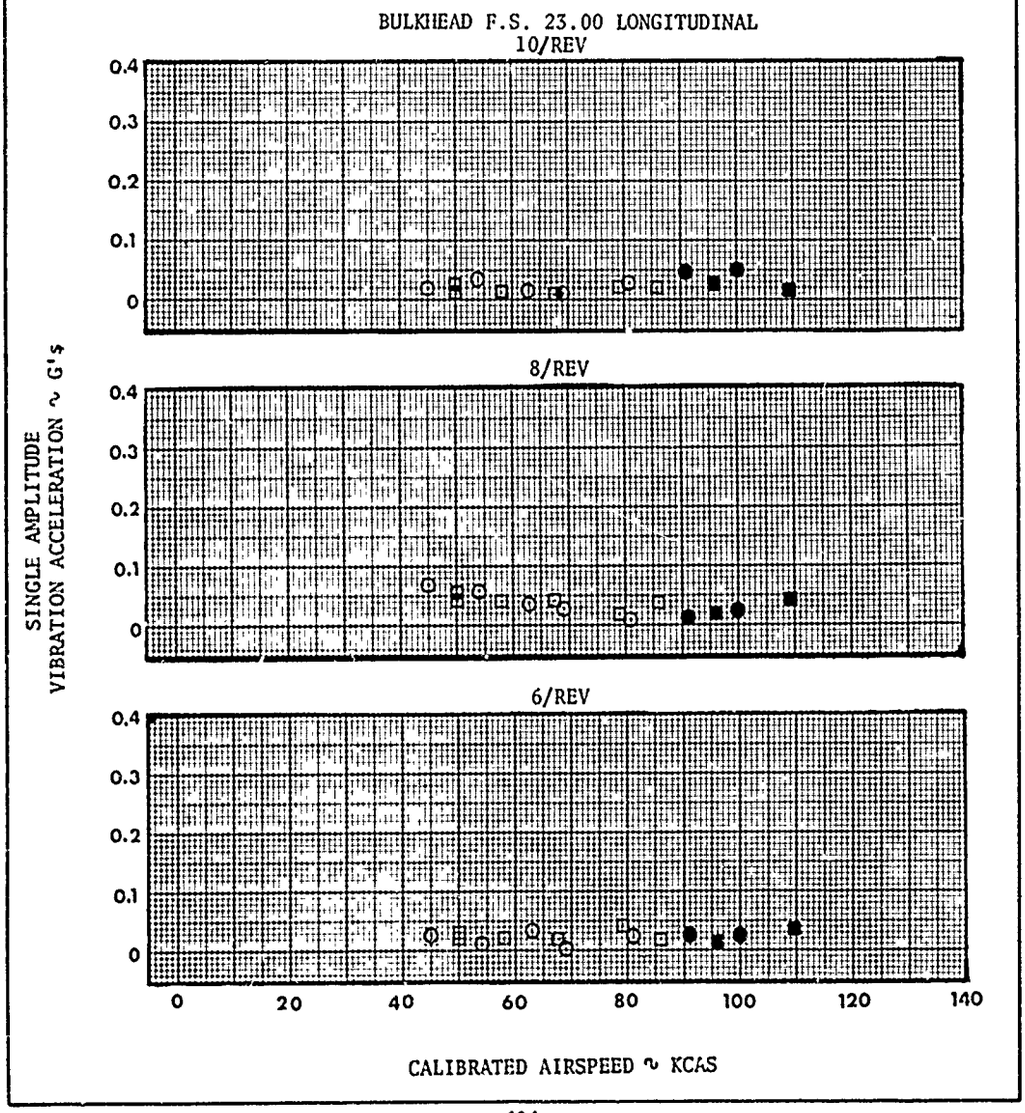


FIGURE 54
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
□	8800	8120	126.1	0.6 LT	322	INSTALL	LEVEL FLT
■	8740	8000	126.0	0.6 LT	320	INSTALL	DIVING FLT
○	8790	8300	127.5	1.2 LT	318	REMOVED	LEVEL FLT
●	8750	8300	127.4	1.2 LT	320	REMOVED	DIVING FLT

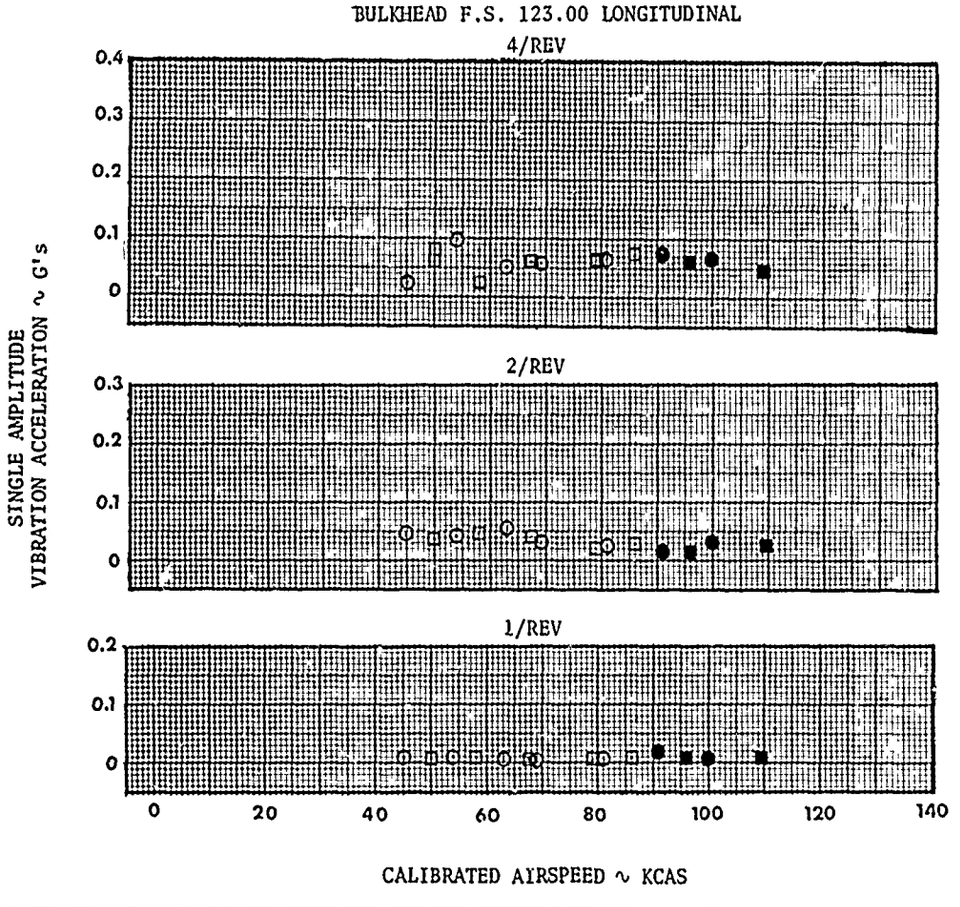


FIGURE 54 (CONTINUED)

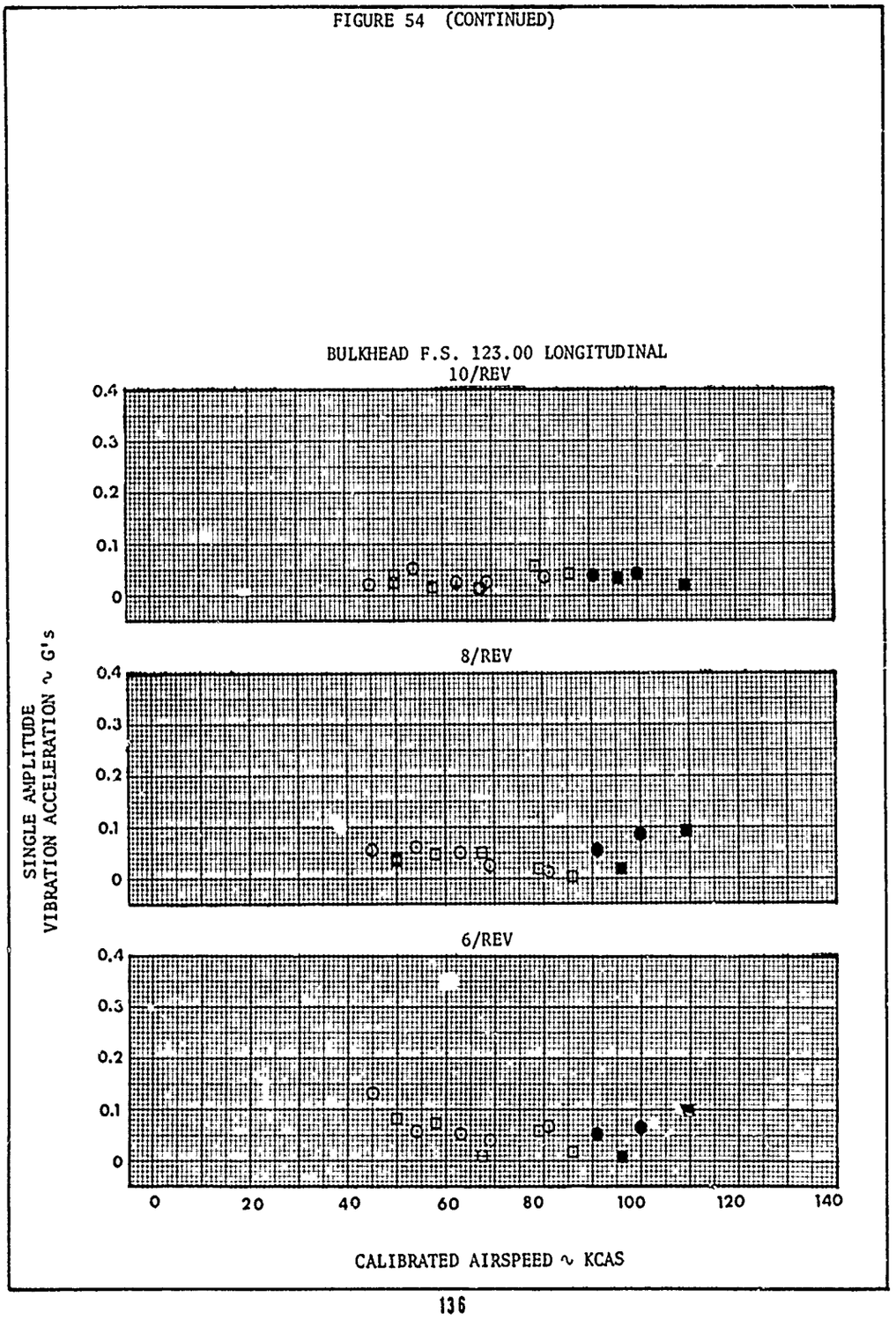


FIGURE 55

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬡	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
⏢	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
○	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
⏢	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬢	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
▶	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
◔	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

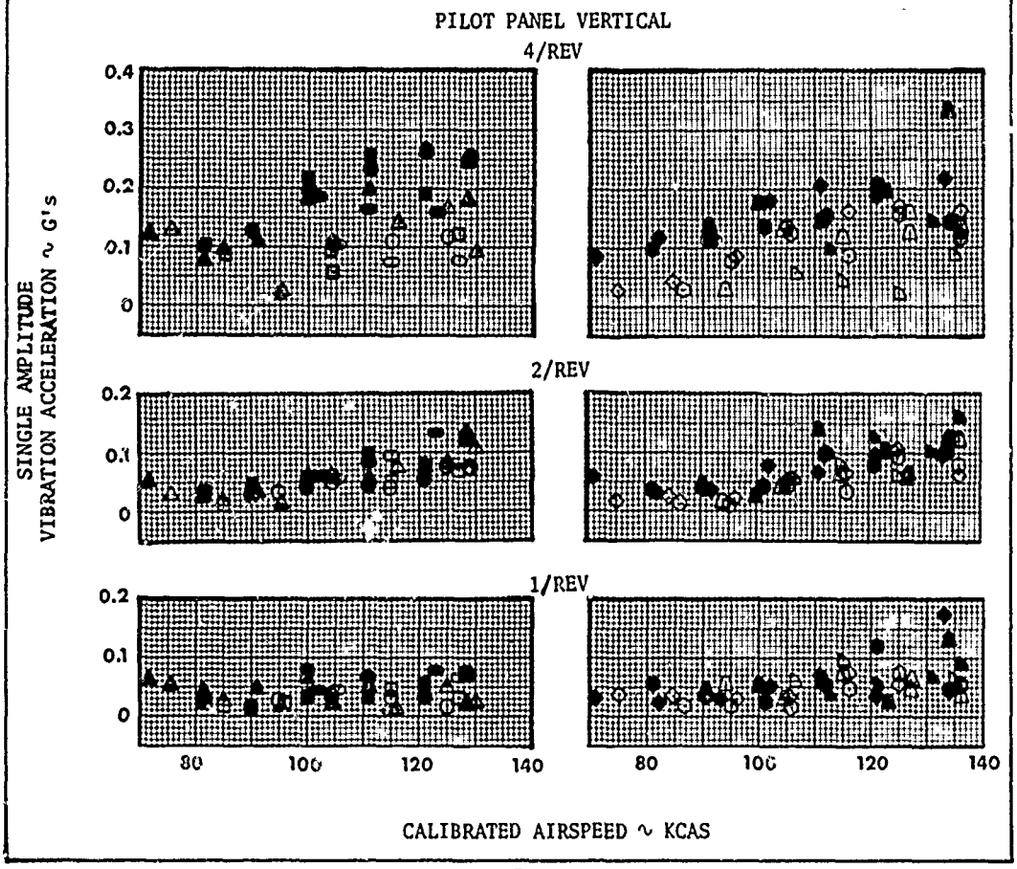


FIGURE 55 (CONTINUED)

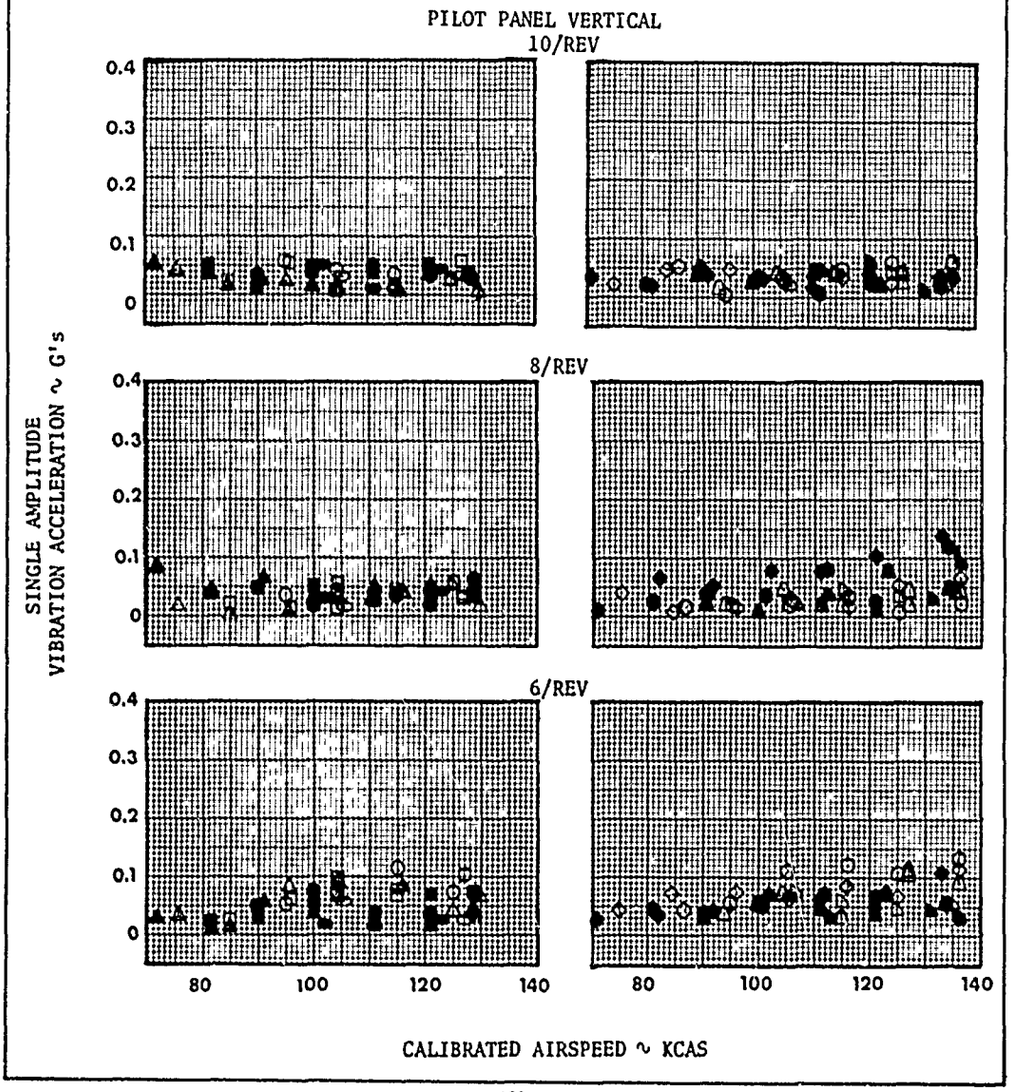


FIGURE 56

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬭	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◣	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

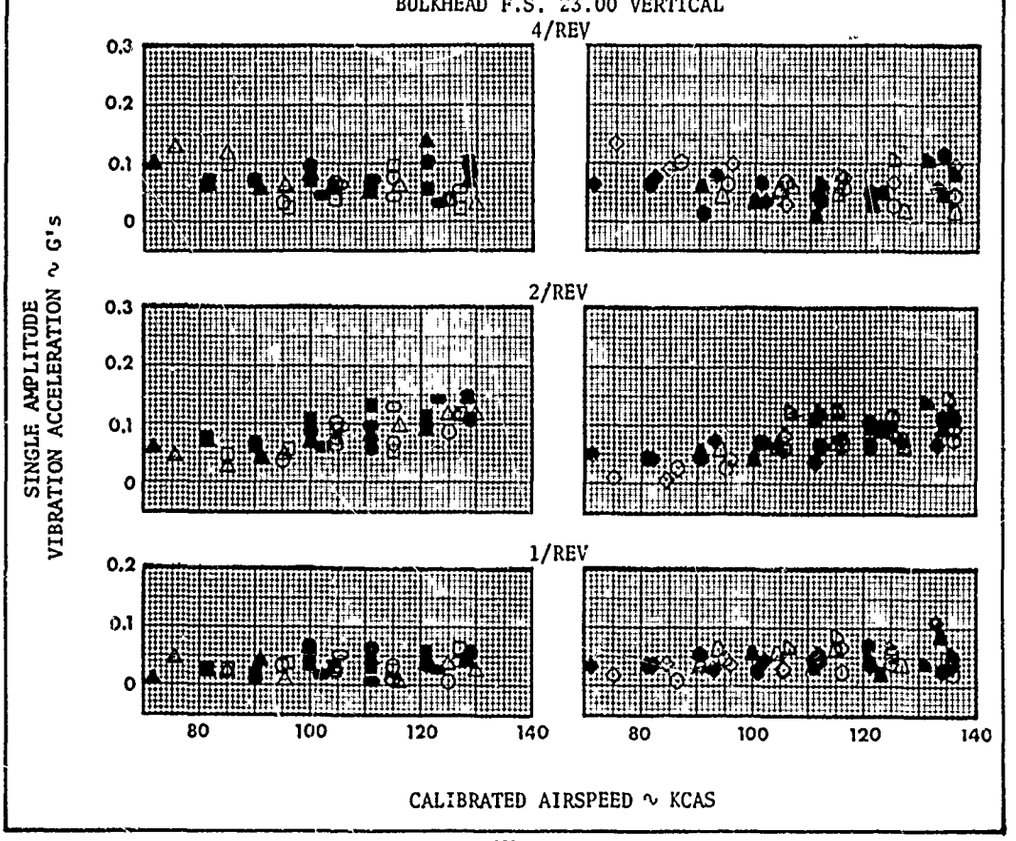


FIGURE 56 (CONTINUED)

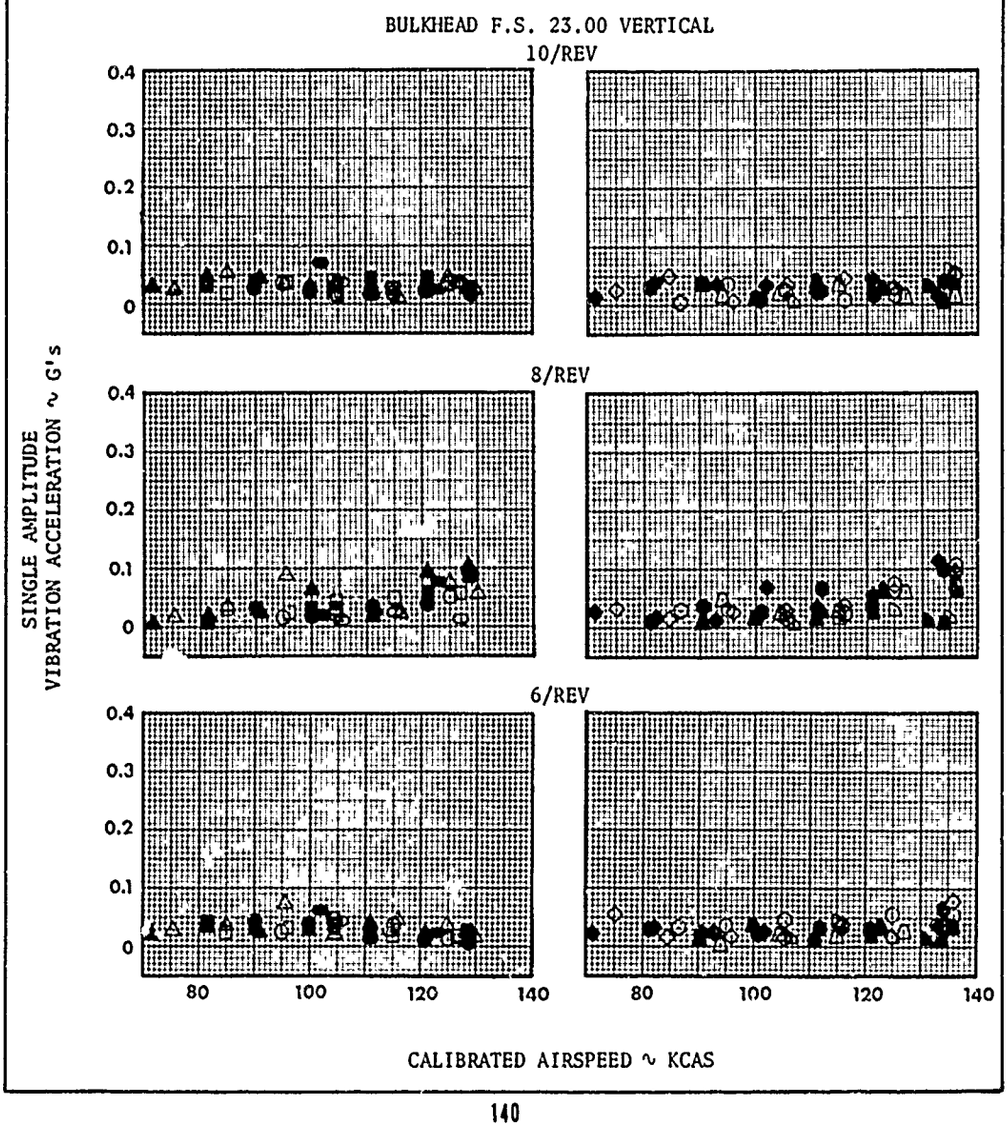


FIGURE 57

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬯	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◗	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

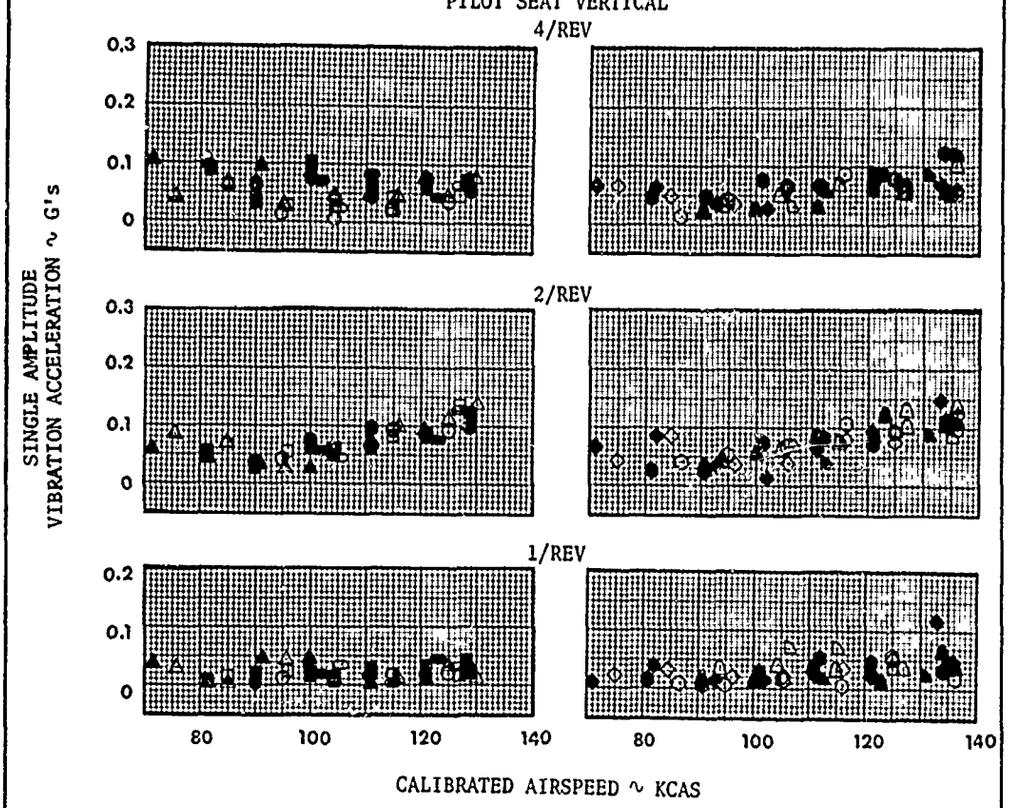


FIGURE 57 (CONTINUED)

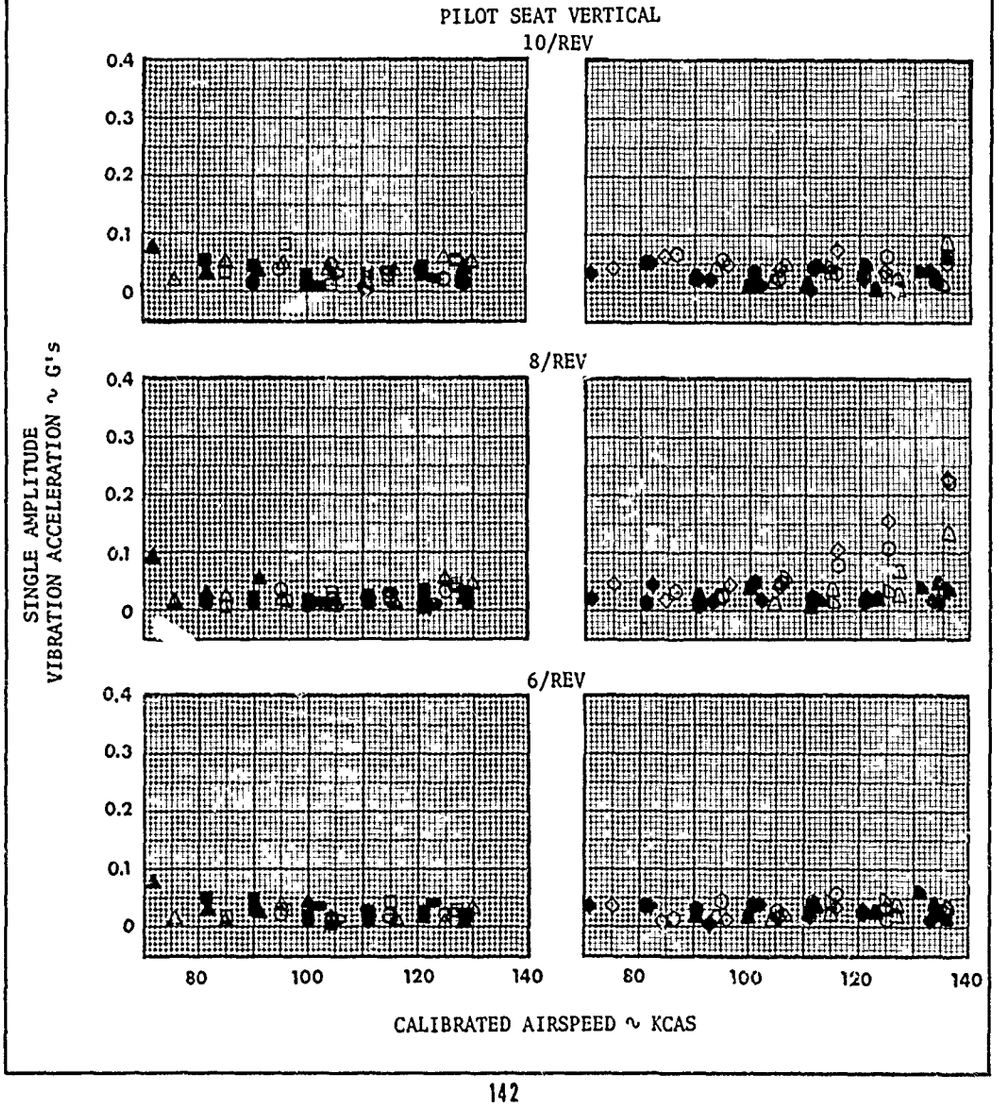


FIGURE 58

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬭	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
○	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◣	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

BULKHEAD F.S. 123.00 VERTICAL

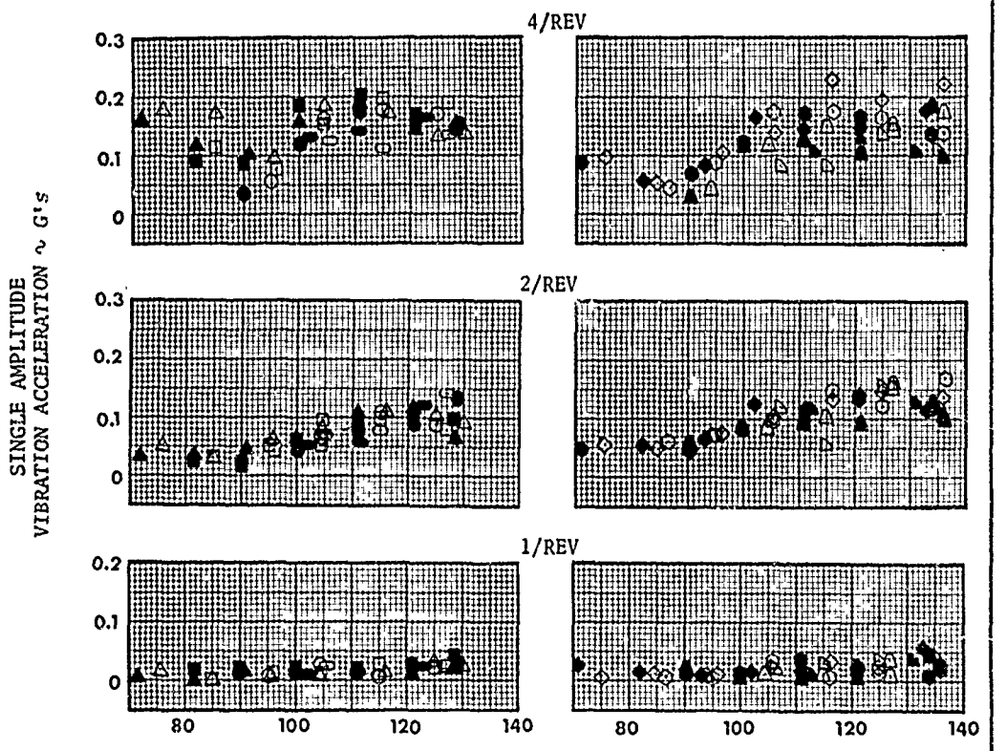


FIGURE 58 (CONTINUED)

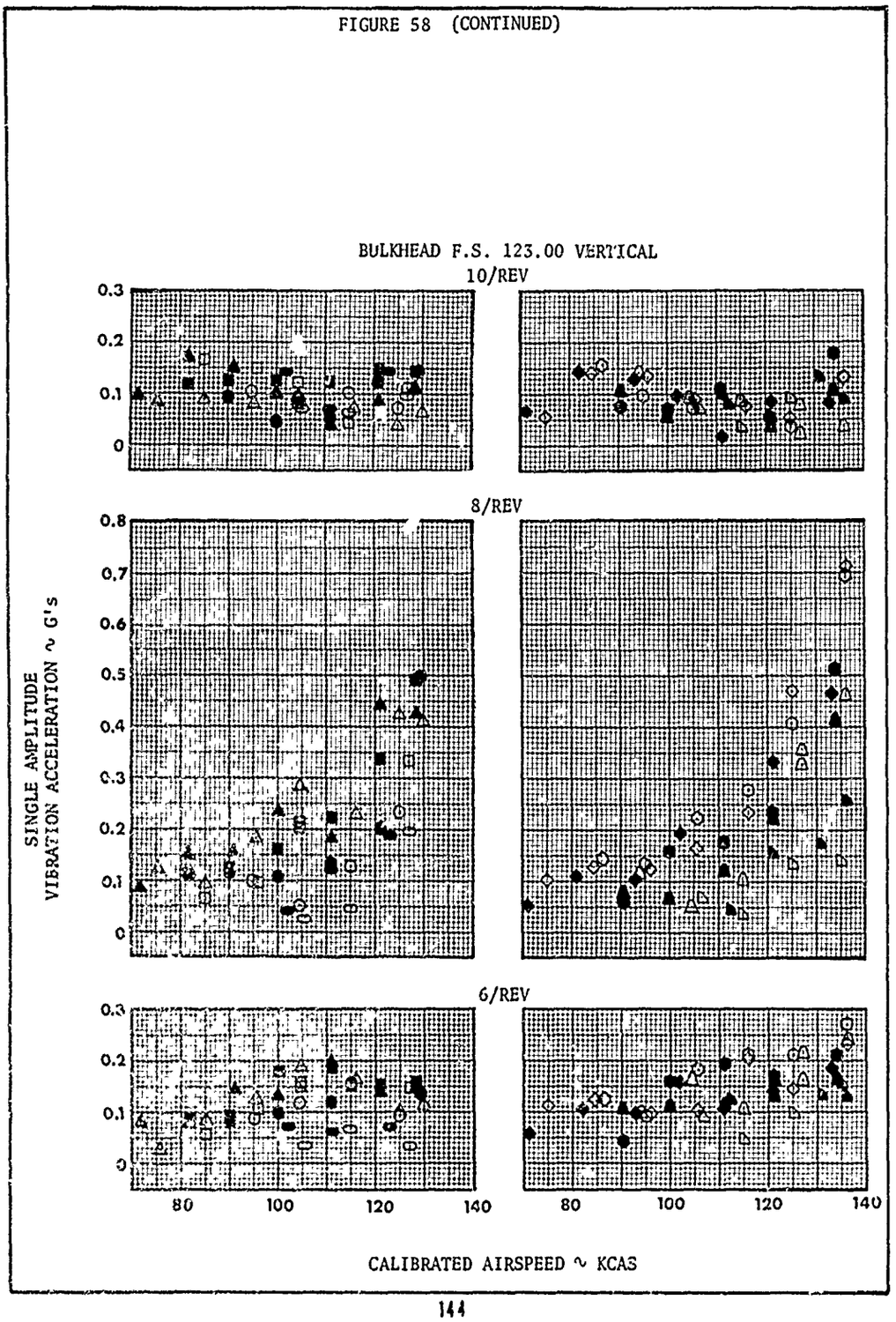


FIGURE 59

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬭	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◤	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

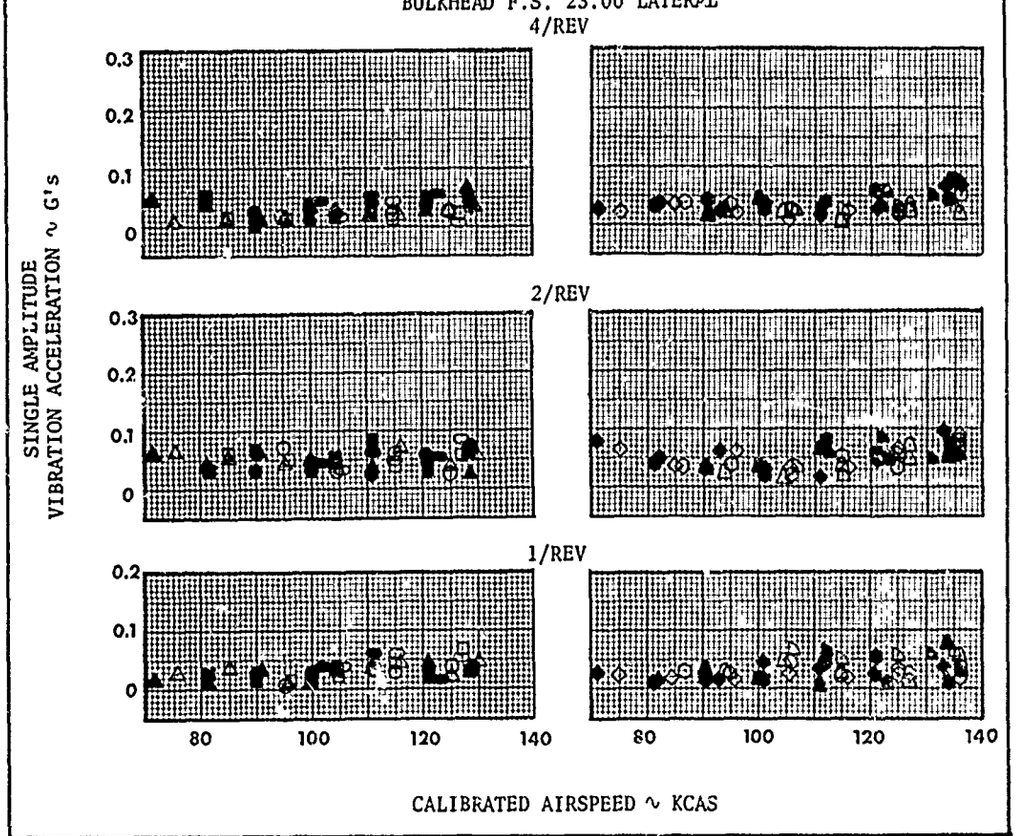


FIGURE 59 (CONTINUED)

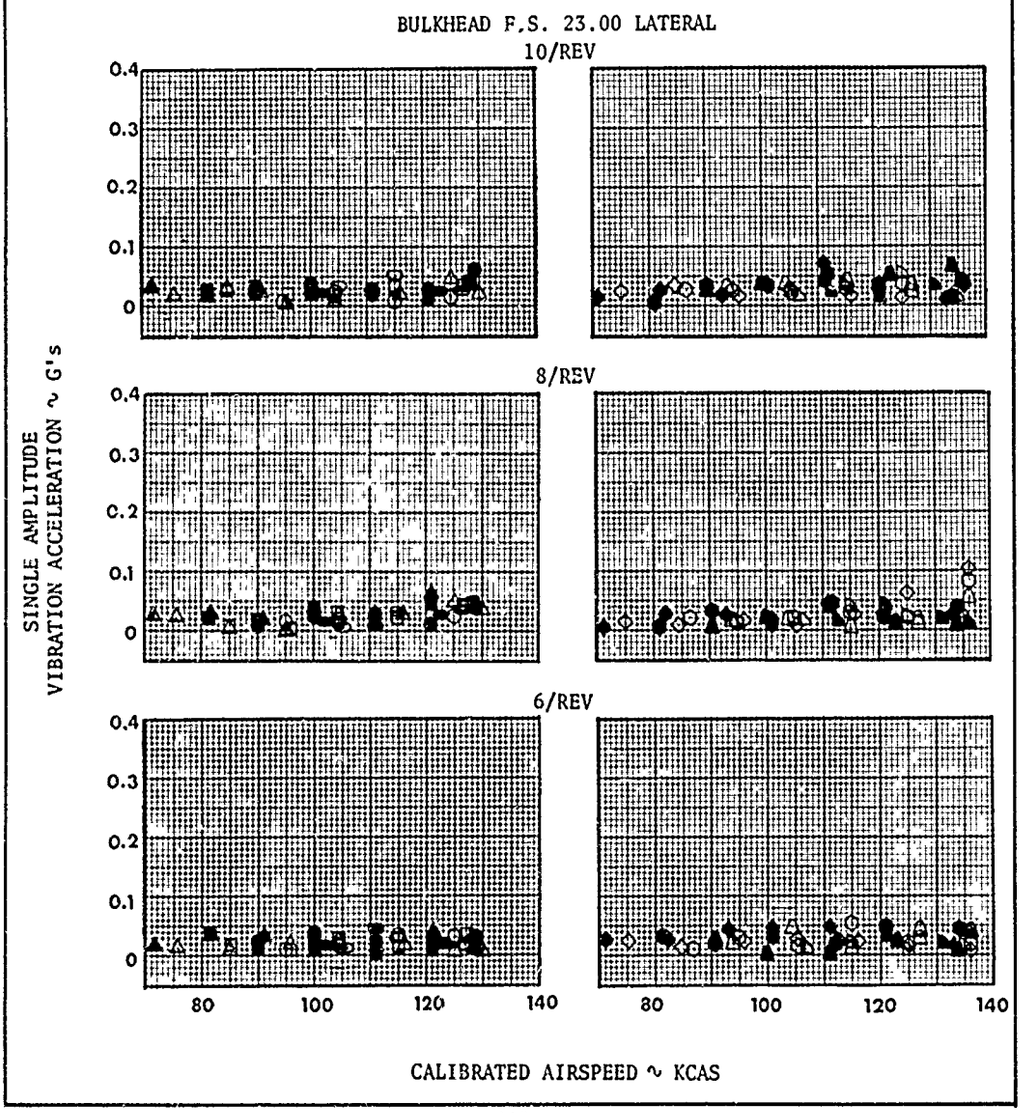


FIGURE 60

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬭	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◣	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
●	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

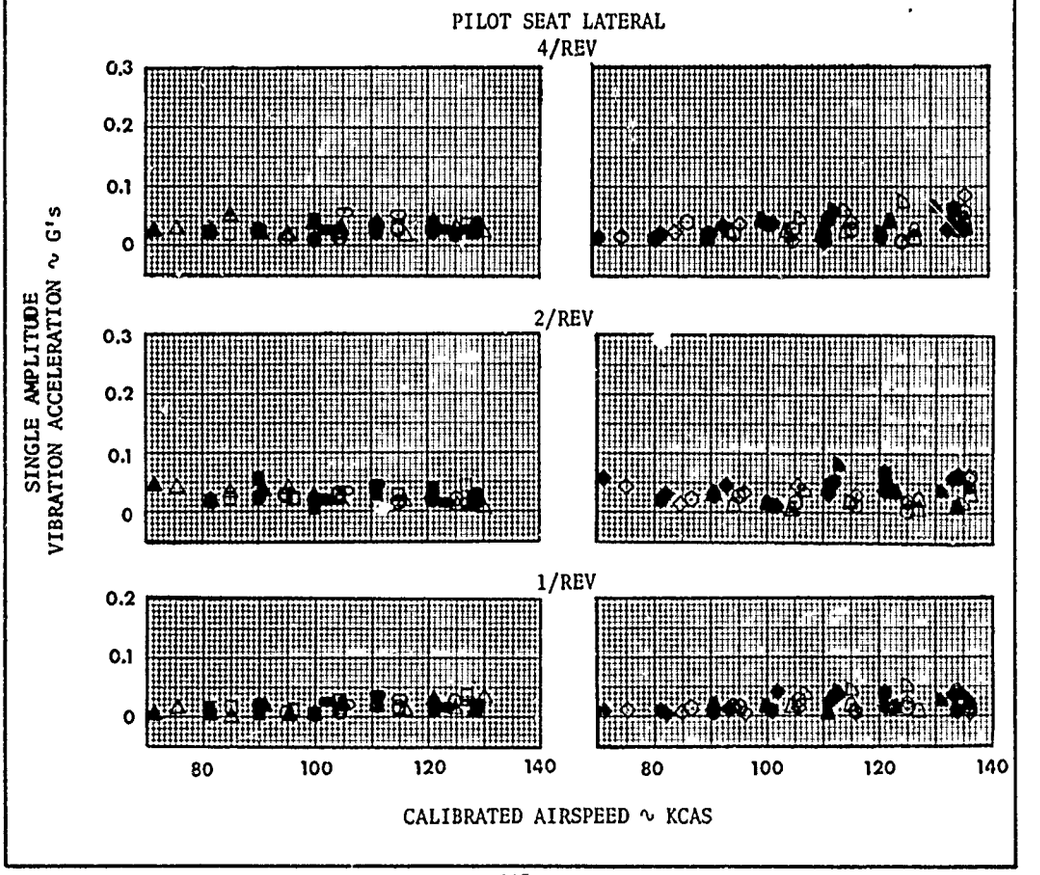


FIGURE 60 (CONTINUED)

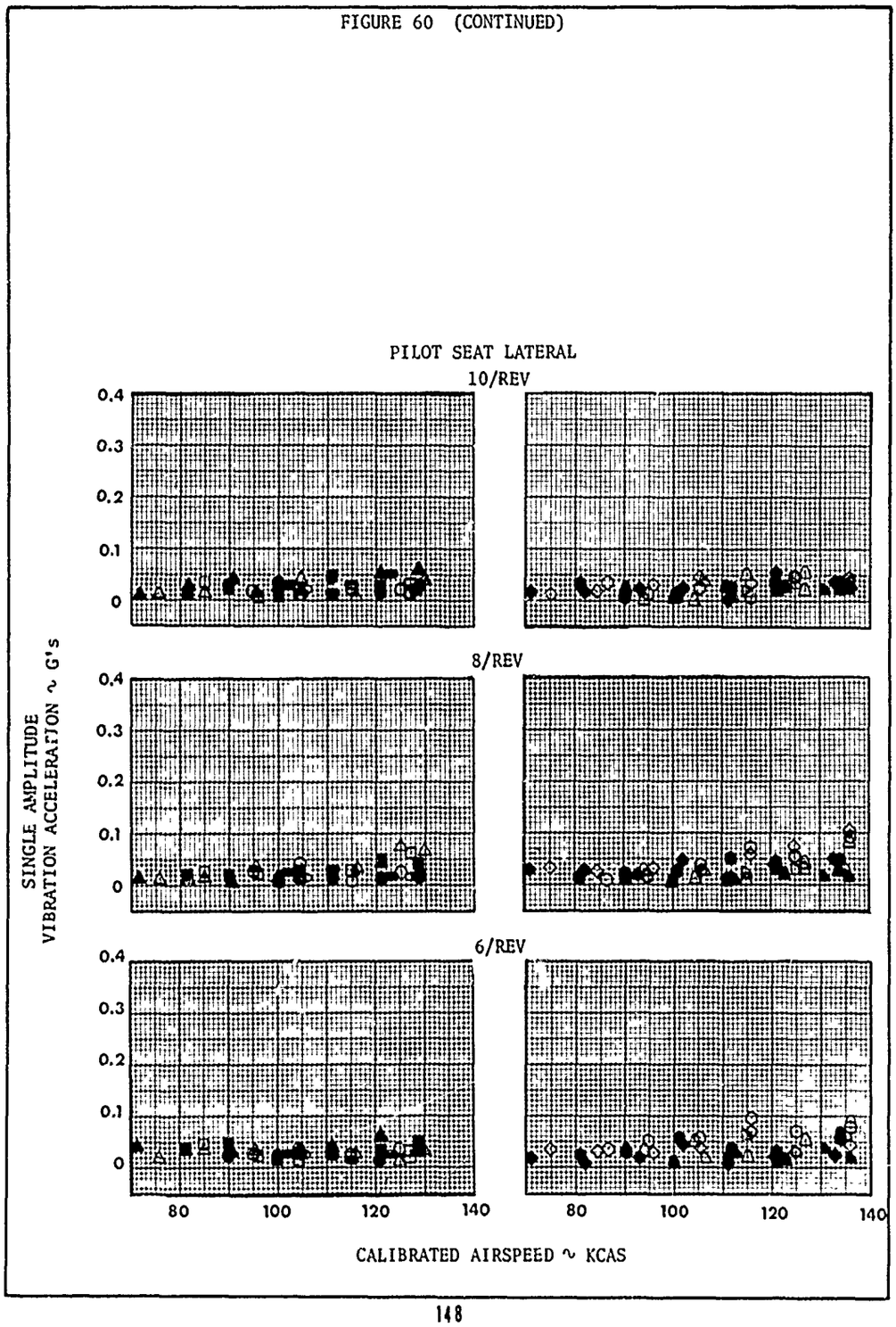


FIGURE 61
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬭	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◣	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

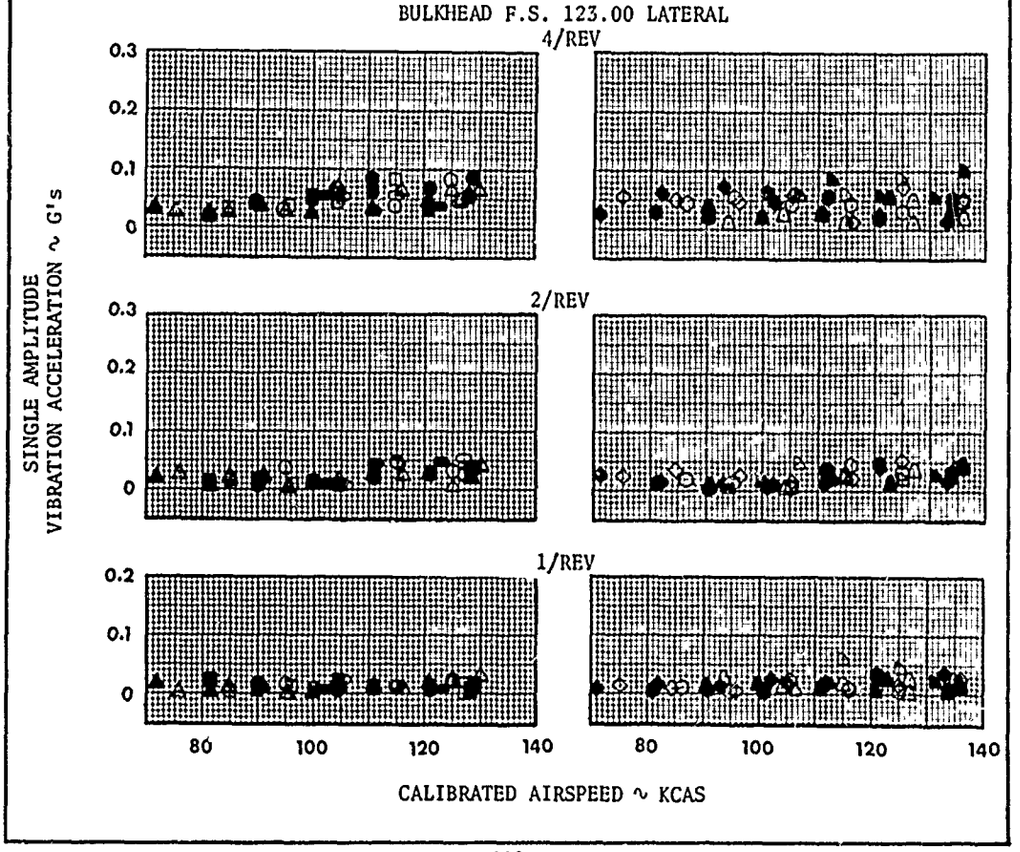


FIGURE 61 (CONTINUED)

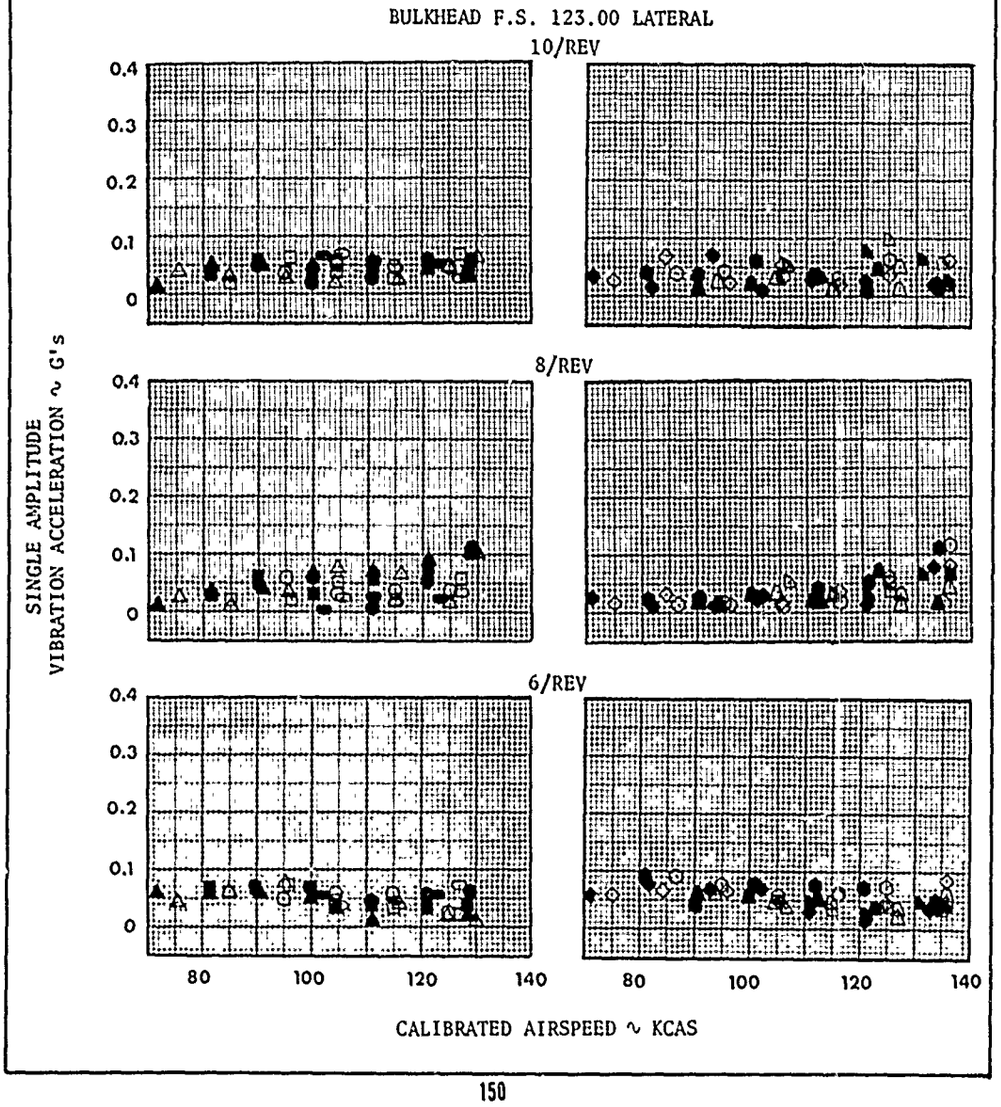


FIGURE 62
VIBRATION CHARACTERISTICS
UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⬯	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
⬡	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◤	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
⬢	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

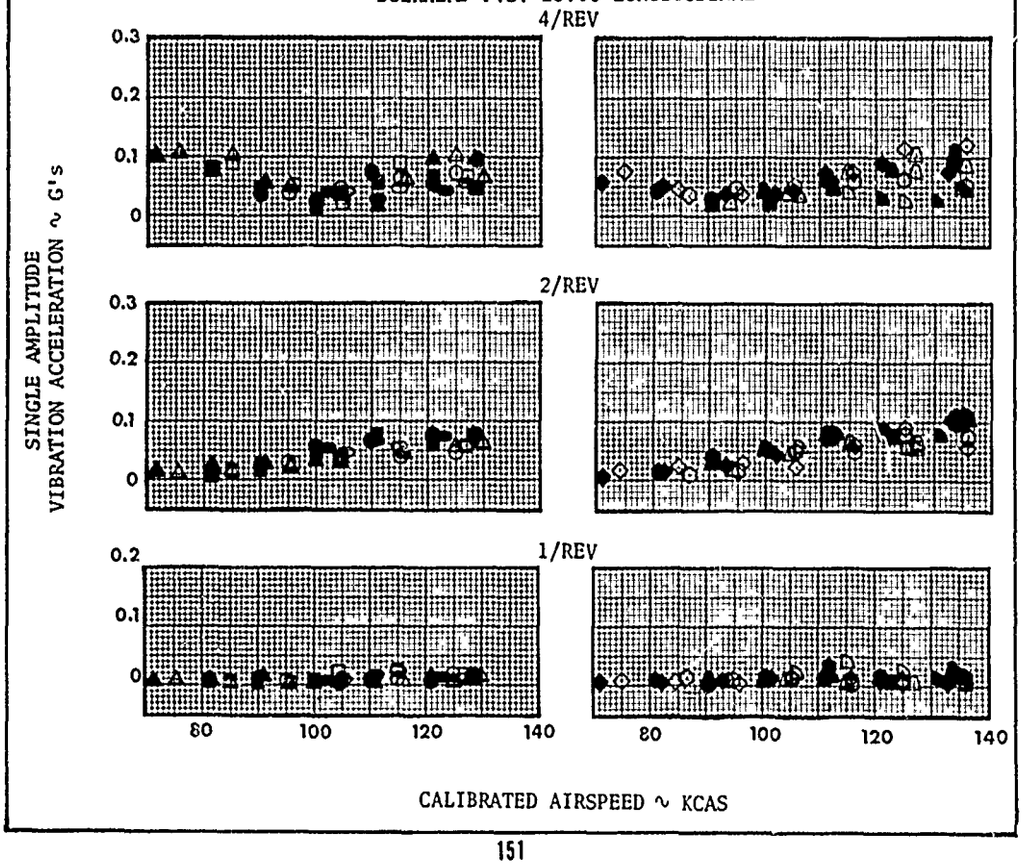


FIGURE 62 (CONTINUED)

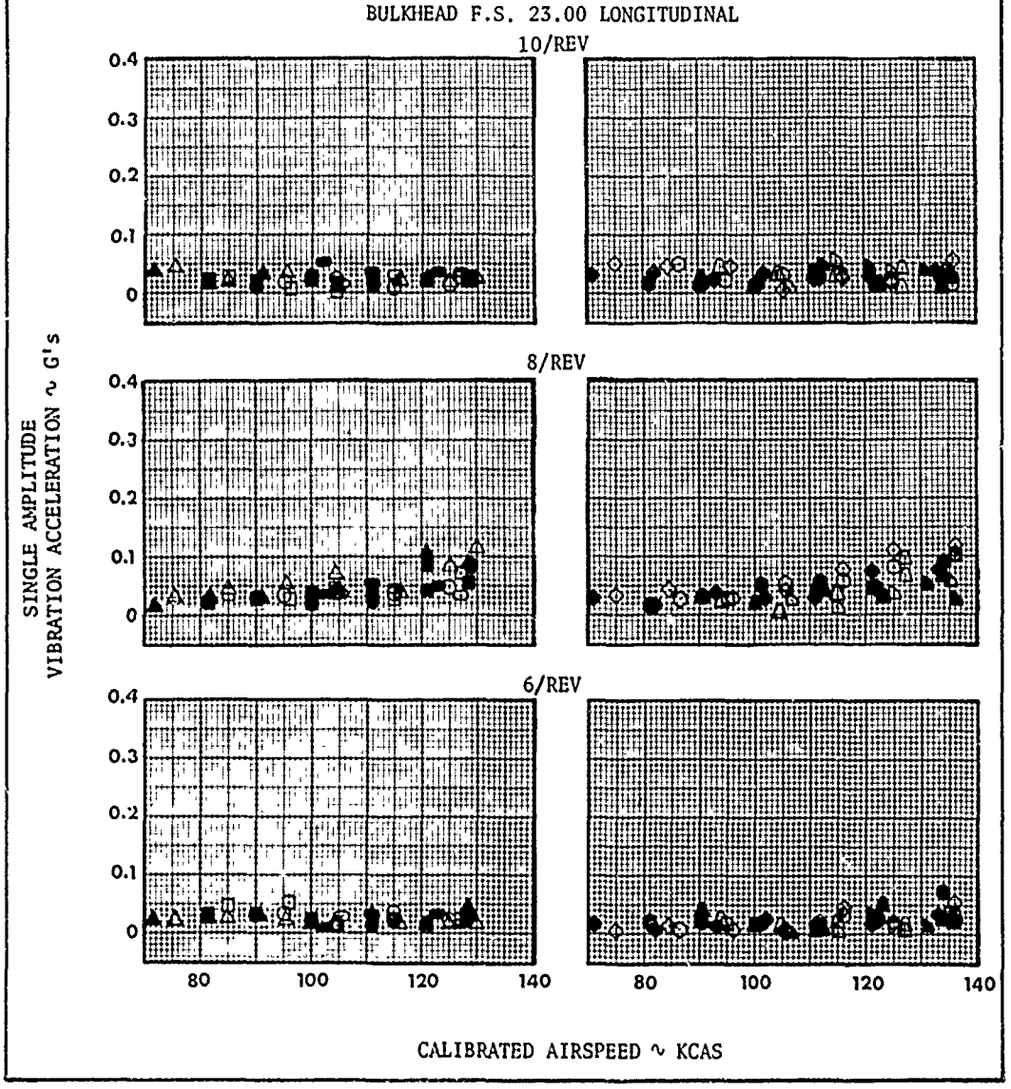


FIGURE 63

VIBRATION CHARACTERISTICS

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INSTALL	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INSTALL	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INSTALL	DIVING FLT
⊙	8860	3010	128.6	0.8 RT	322	INSTALL	DIVING FLT
▷	8060	2000	128.5	0.3 RT	320	INSTALL	DIVING FLT
△	7990	2300	128.4	0.3 RT	322	INSTALL	DIVING FLT
○	7930	3200	128.3	0.3 RT	322	INSTALL	DIVING FLT
◇	7880	3500	128.2	0.3 RT	322	INSTALL	DIVING FLT
●	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
■	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
▲	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⬬	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◣	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
●	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◆	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

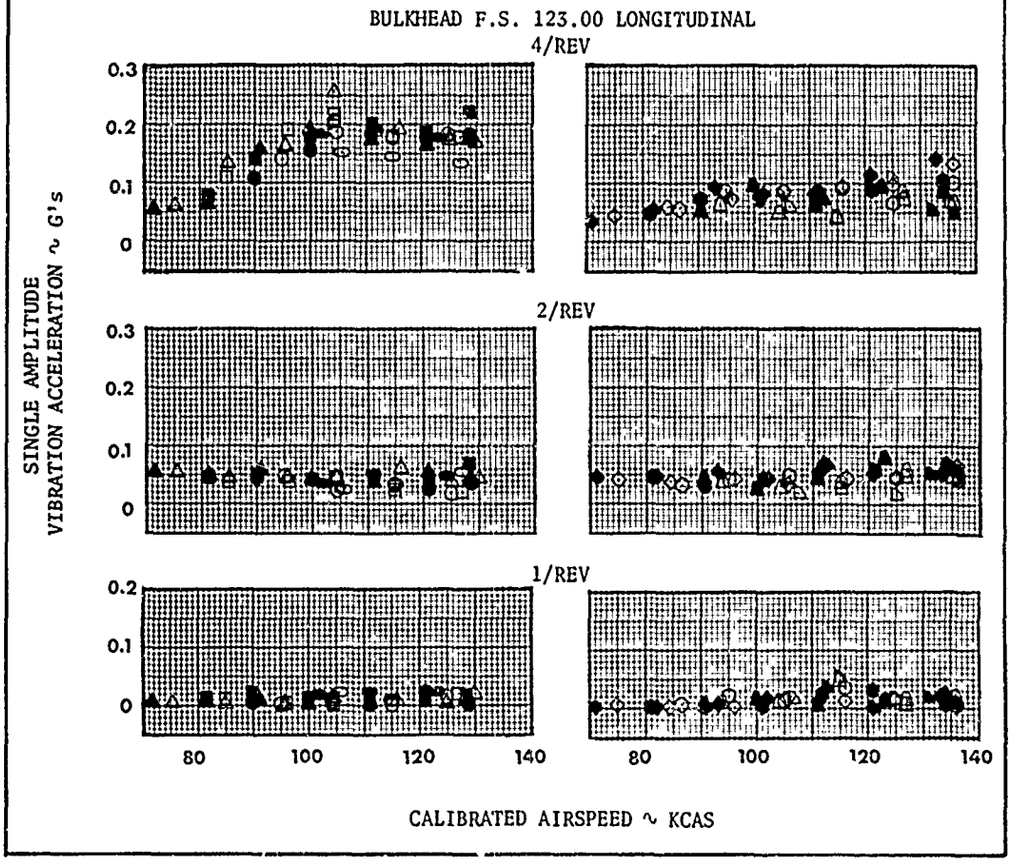


FIGURE 63 (CONTINUED)

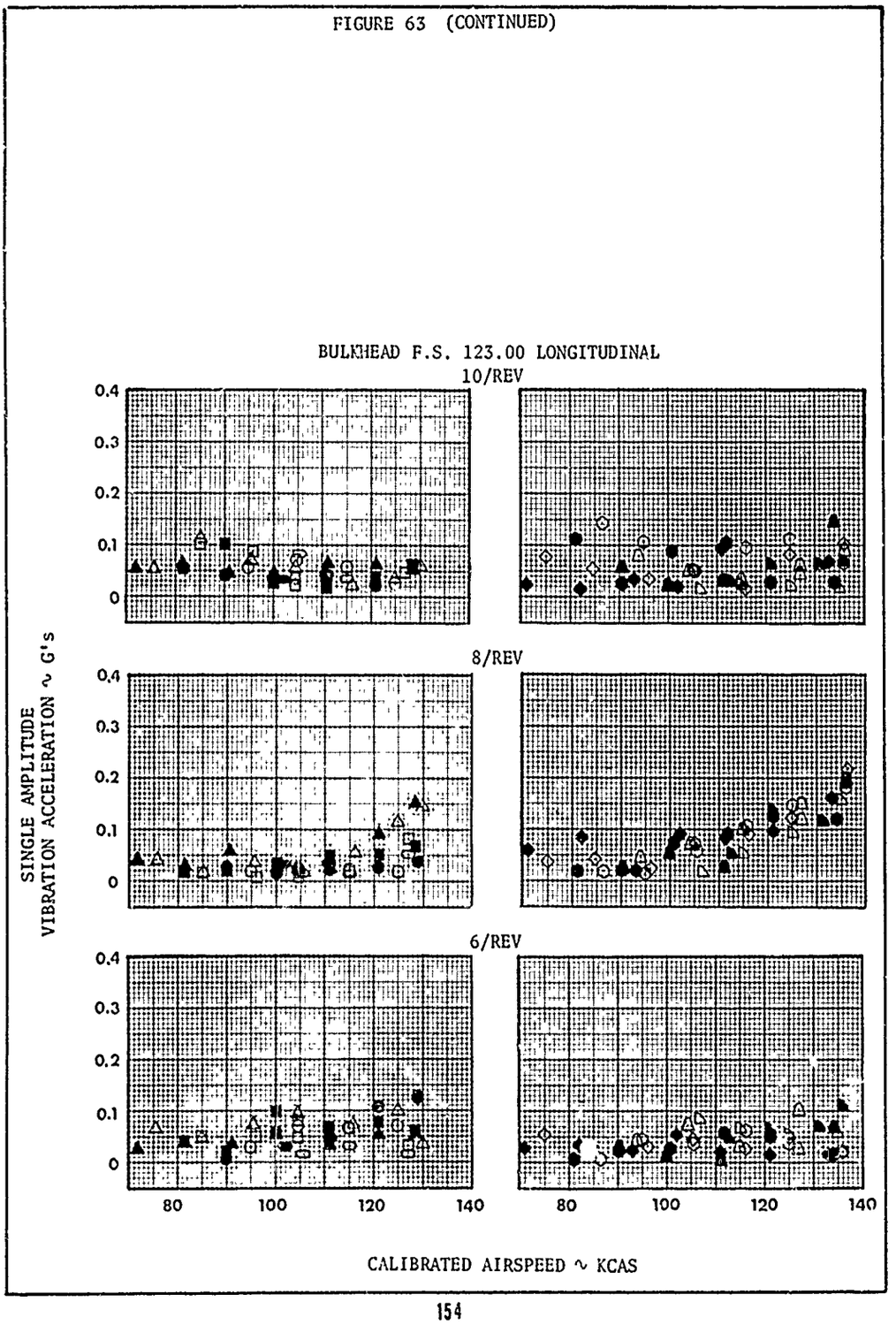


FIGURE 64

RIGHT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66-0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	9500	890	129.2	0.7 RT	320	INST	HOVERING FLT
●	9250	2470	129.0	0.7 RT	322	INST	LEVEL FLT
■	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
▲	9110	5000	128.8	0.8 RT	322	INST	CLIMBING FLT
▲	9050	6500	128.8	0.8 RT	322	INST	PART PWR DESCENT
●	9030	3000	128.8	0.8 RT	318	INST	AUTOROTATION
◗	8750	1120	128.5	0.8 RT	320	INST	HOVERING FLT
◇	9520	585	129.2	0.2 RT	320	REMOVED	HOVERING FLT
○	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
□	9200	2390	129.9	0.2 RT	320	REMOVED	DIVING FLT
△	9140	5000	129.9	0.3 RT	322	REMOVED	CLIMBING FLT
◺	9080	6500	129.9	0.3 RT	322	REMOVED	PART PWR DESCENT
◗	9060	3000	129.8	0.3 RT	318	REMOVED	AUTOROTATION
◗	8710	810	128.5	0.3 RT	320	REMOVED	HOVERING FLT

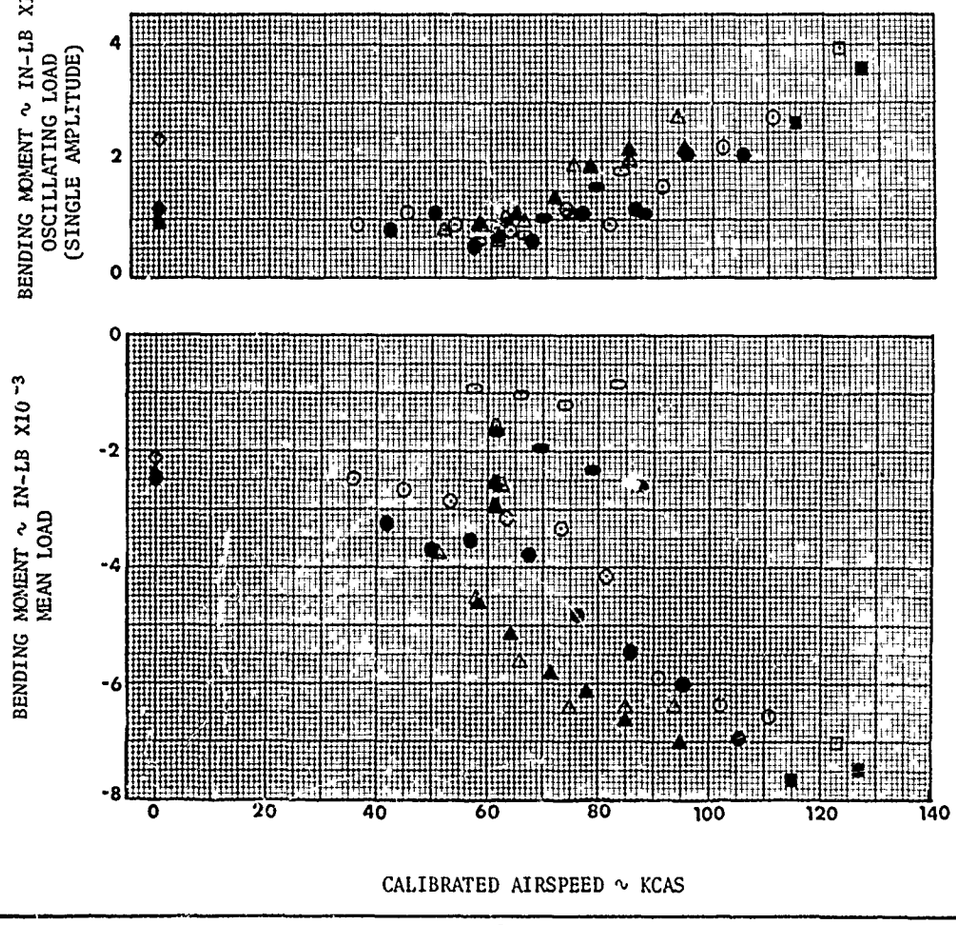


FIGURE 65
RIGHT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9540	960	126.8	0.5 LT	324	INST	HOVERING FLT
○	9280	2440	126.5	0.5 LT	322	INST	LEVEL FLT
●	9210	2400	126.4	0.5 LT	318	INST	DIVING FLT
△	8910	5000	126.1	0.5 LT	322	INST	CLIMBING FLT
◺	8710	6500	125.9	0.6 LT	320	INST	PART PWR DESCENT
◎	8680	4000	125.9	0.6 LT	320	INST	AUTOROTATION
□	8540	2480	125.7	0.6 LT	320	INST	LEVEL FLT
■	8430	2600	125.6	0.6 LT	322	INST	DIVING FLT
▷	8340	1190	125.5	0.6 LT	322	INST	HOVERING FLT

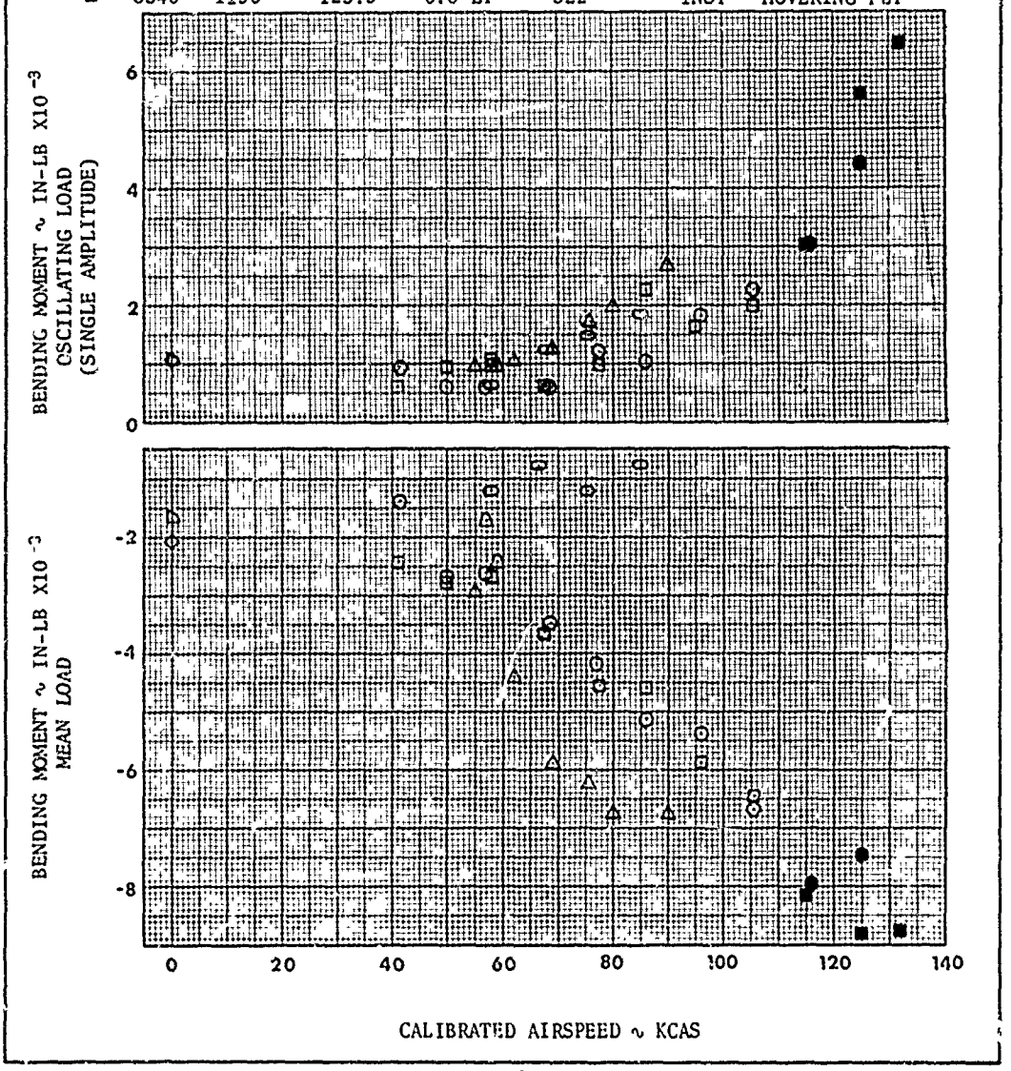


FIGURE 66

RIGHT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	8320	1450	128.7	0.3 RT	320	INST	HOVERING FLT
●	8160	2340	128.5	0.3 RT	320	INST	LEVEL FLT
■	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
○	8120	2370	128.8	0.0	322	REMOVED	LEVEL FLT
□	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT

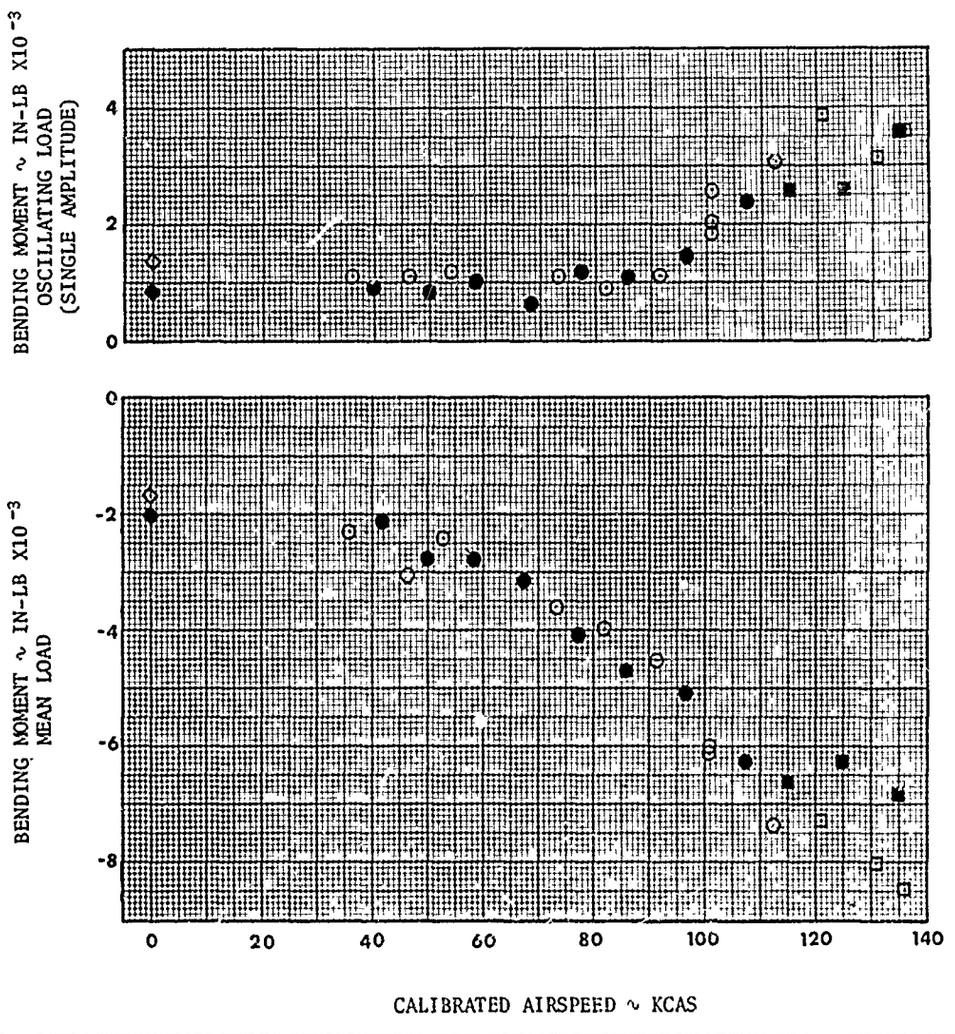


FIGURE 67

RIGHT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	8800	8120	126.1	0.6 LT	322	INST	LEVEL FLT
●	8740	8000	126.0	0.6 LT	322	INST	DIVING FLT

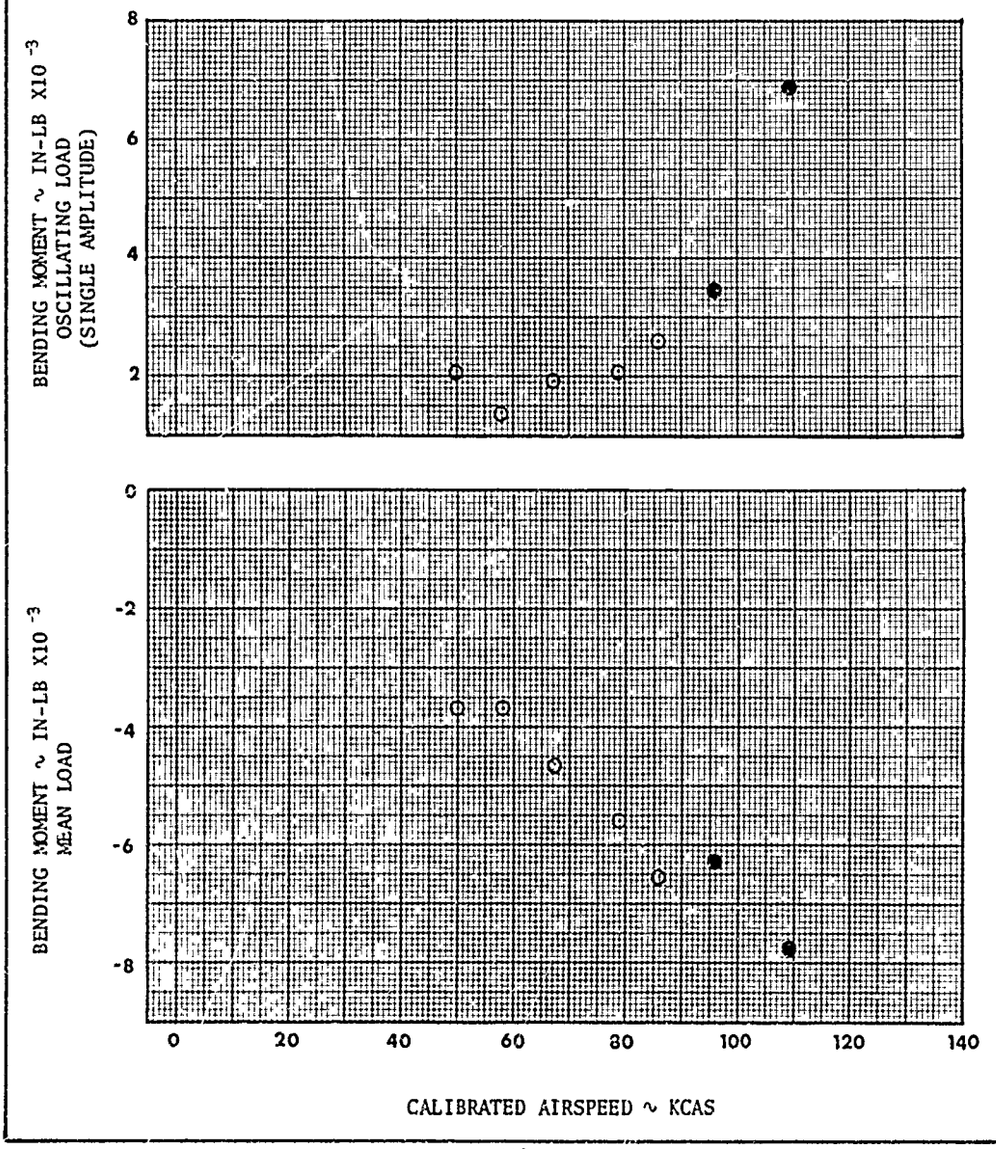


FIGURE 68

RIGHT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
□	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
△	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
◇	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
▷	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▷	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
○	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
○	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

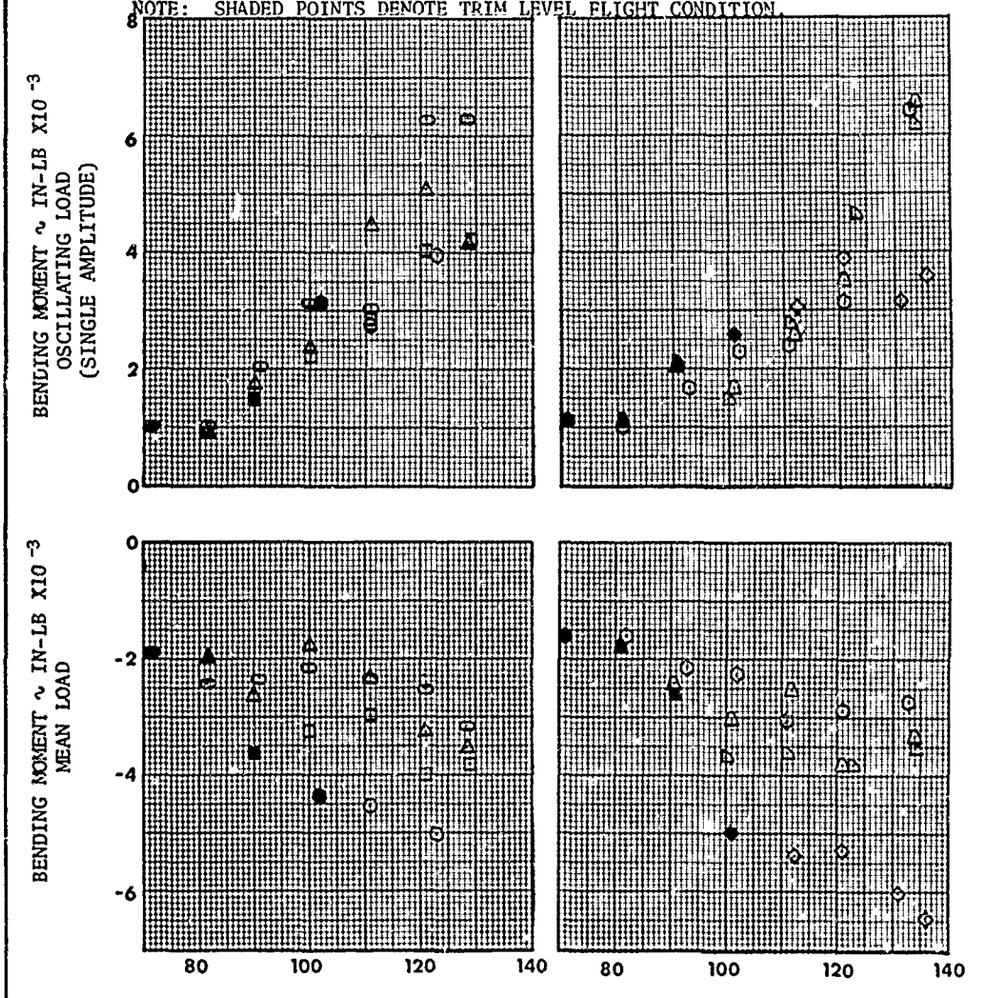


FIGURE 69
RIGHT ELEVATOR BEAM BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INST	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INST	DIVING FLT
⬯	8860	3010	128.6	0.8 RT	322	INST	DIVING FLT
◇	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
▷	7990	2300	128.4	0.3 RT	322	INST	DIVING FLT
▷	7930	3200	128.3	0.3 RT	322	INST	DIVING FLT
○	7830	3500	128.2	0.3 RT	322	INST	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

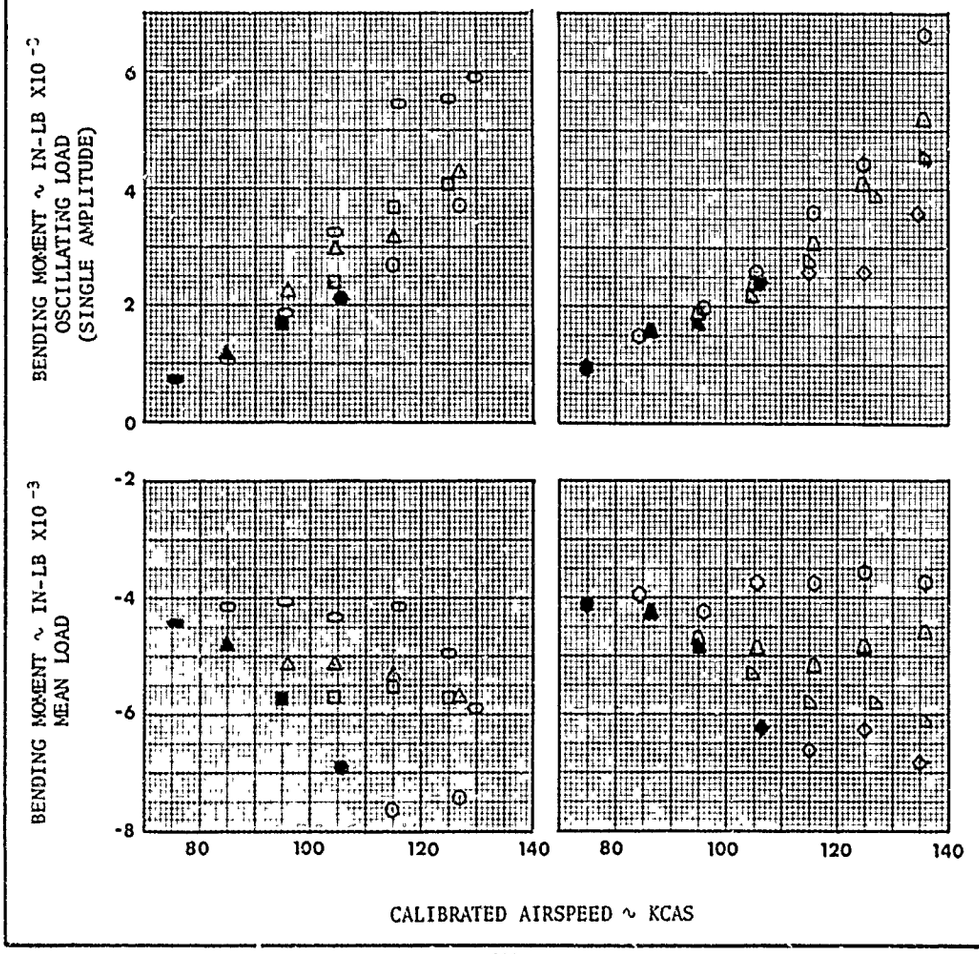


FIGURE 70
RIGHT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	9500	890	129.2	0.7 RT	320	INST	HOVERING FLT
●	9250	2470	129.0	0.7 RT	322	INST	LEVEL FLT
■	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
▲	9110	5000	128.8	0.8 RT	322	INST	CLIMBING FLT
▲	9050	6500	128.8	0.8 RT	322	INST	PART PWR DESCENT
●	9030	3000	128.8	0.8 RT	318	INST	AUTOROTATION
◗	8750	1120	128.5	0.8 RT	320	INST	HOVERING FLT
◇	9520	585	129.2	0.2 RT	320	REMOVED	HOVERING FLT
○	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
□	9200	2390	129.9	0.2 RT	320	REMOVED	DIVING FLT
△	9140	5000	129.9	0.3 RT	322	REMOVED	CLIMBING FLT
△	9080	6500	129.9	0.3 RT	322	REMOVED	PART PWR DESCENT
◗	9060	3000	129.8	0.3 RT	318	REMOVED	AUTOROTATION
◗	8710	810	128.5	0.3 RT	320	REMOVED	HOVERING FLT

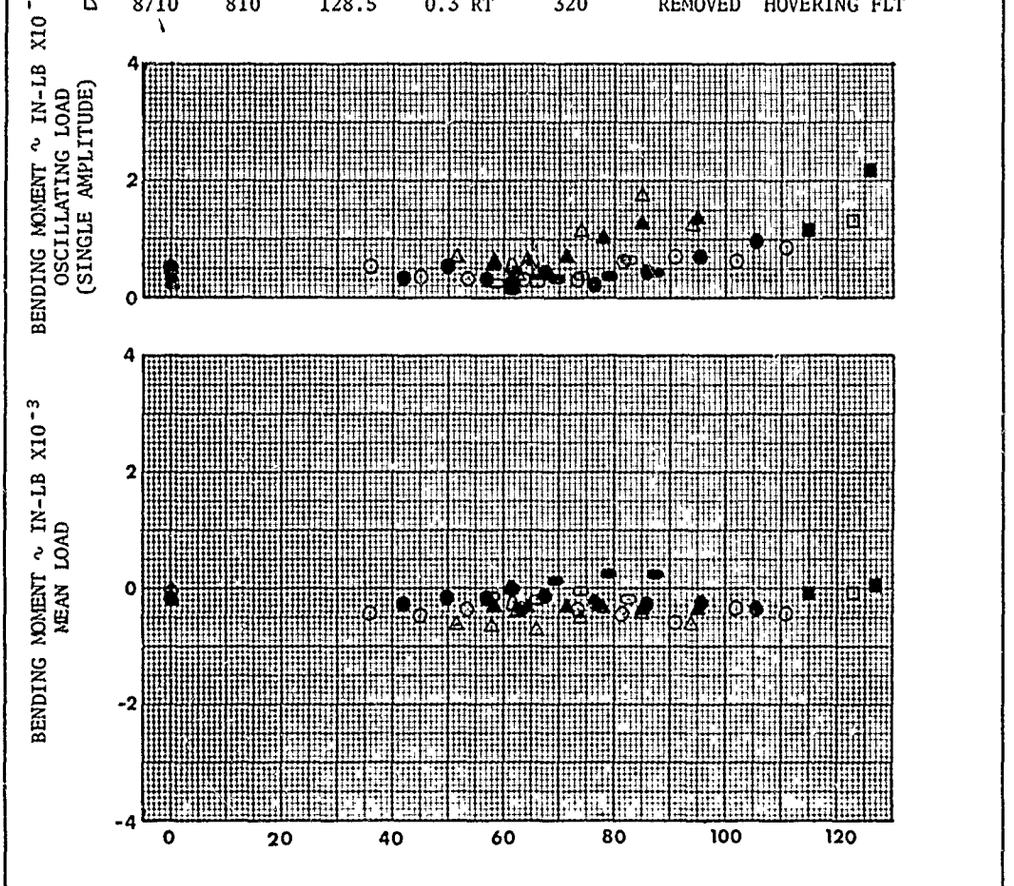


FIGURE 71

RIGHT ELEVATOR CHORD BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9540	960	126.8	0.5 LT	324	INST	HOVERING FLT
○	9280	2440	126.5	0.5 LT	322	INST	LEVEL FLT
●	9210	2400	126.4	0.5 LT	318	INST	DIVING FLT
△	8910	5000	126.1	0.5 LT	322	INST	CLIMBING FLT

NOTE: PARAMETER INOPERATIVE FOR A PORTION OF THE FLIGHT

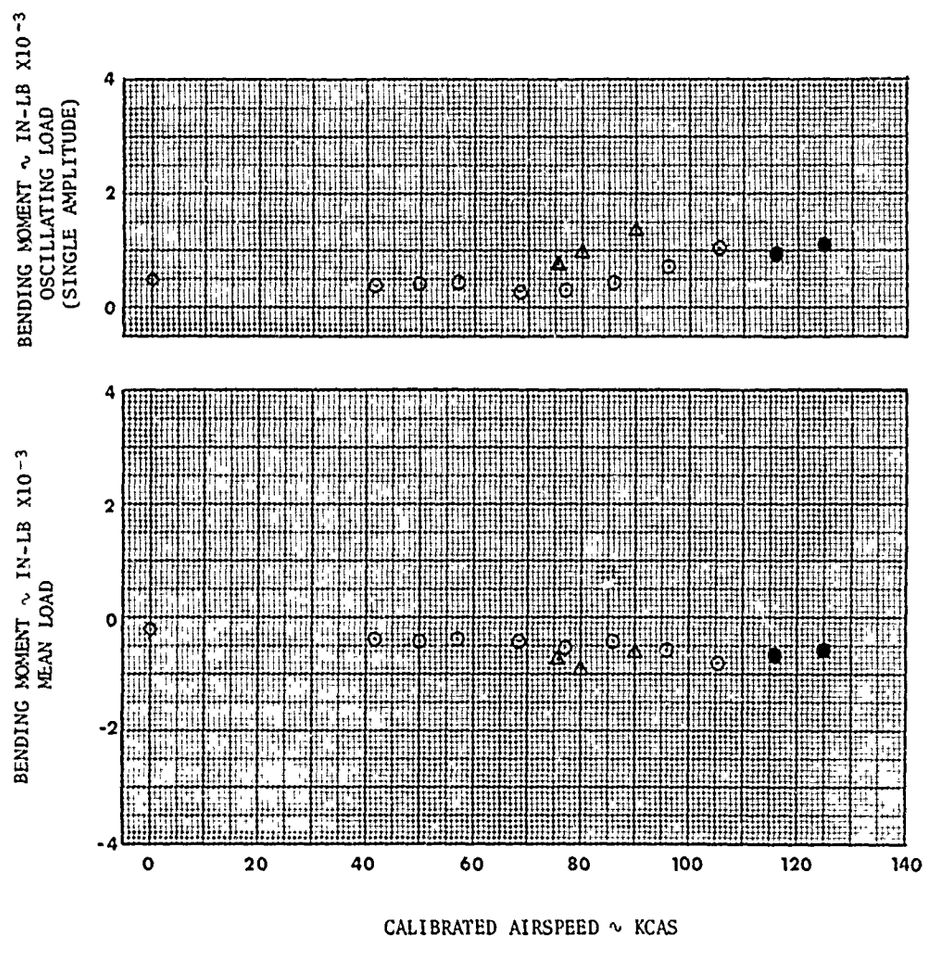


FIGURE 72

RIGHT ELEVATOR CHORD BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	8320	1450	128.7	0.3 RT	320	INST	HOVERING FLT
●	8160	2340	128.5	0.3 RT	320	INST	LEVEL FLT
■	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
○	8120	2370	128.8	0.0	322	REMOVED	LEVEL FLT
□	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT

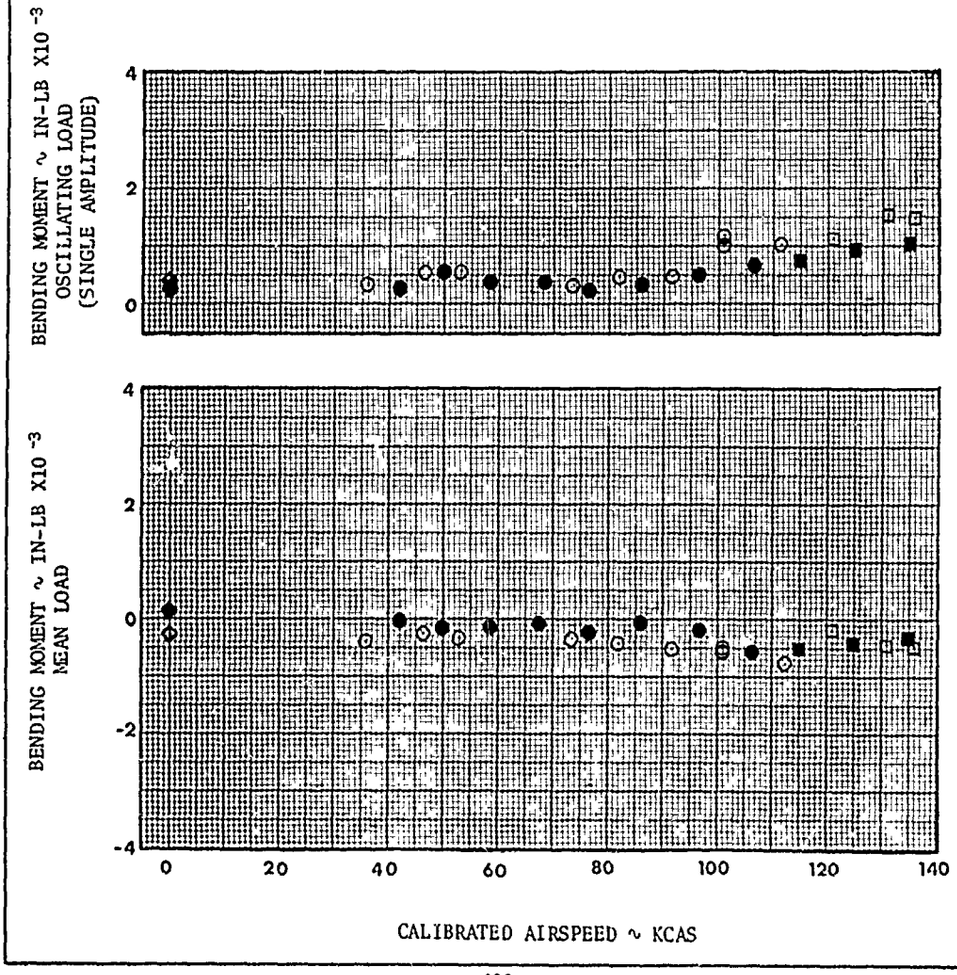


FIGURE 73
RIGHT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	322	REMOVED	LEVEL FLT
□	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7590	4000	127.7	1.6 LT	322	REMOVED	CLIMBING FLT
⏢	7540	6000	127.7	1.7 LT	322	REMOVED	PART PWR DESCENT
⏀	7310	3500	127.4	1.7 LT	302	REMOVED	AUTOROTATION
◆	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
●	7460	4990	135.7	0.5 RT	324	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	320	REMOVED	DIVING FLT
▲	7580	5000	135.7	0.5 RT	322	REMOVED	CLIMBING FLT
⏢	7540	6000	135.7	0.5 RT	320	REMOVED	PART PWR DESCENT
⏀	7300	2500	135.7	0.5 RT	300	REMOVED	AUTOROTATION

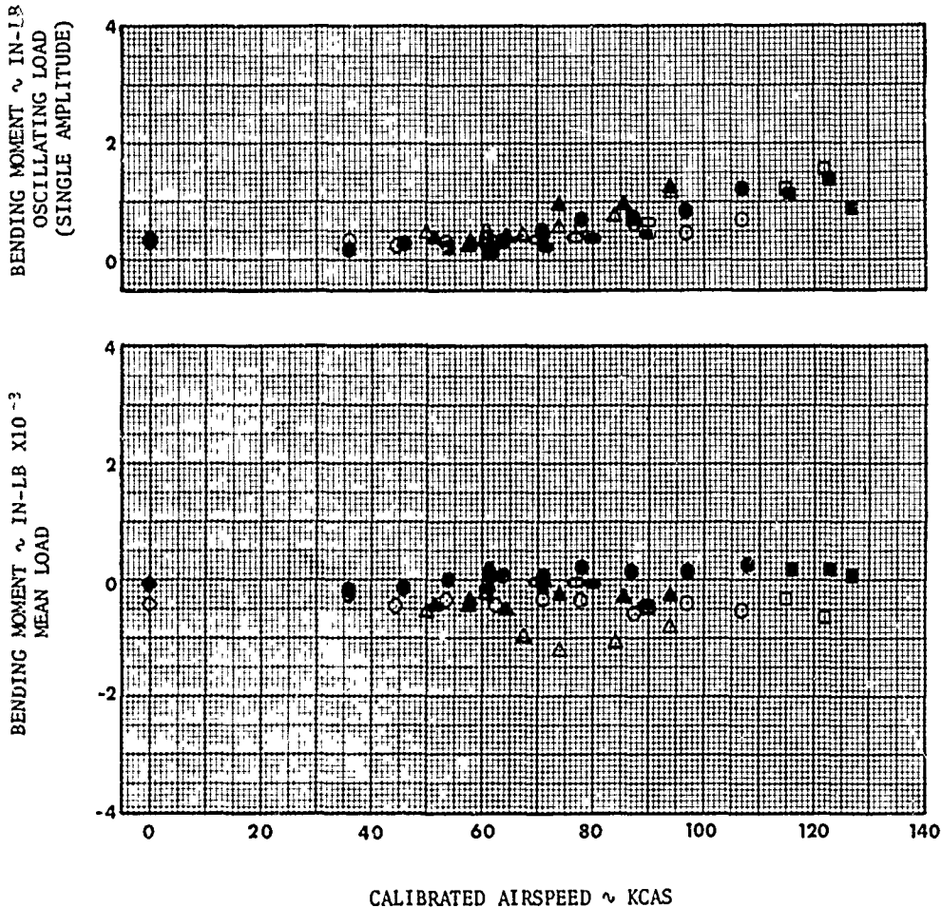


FIGURE 74

RIGHT ELEVATOR CHORD BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
□	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
△	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
◇	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
▷	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▷	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
▷	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
○	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

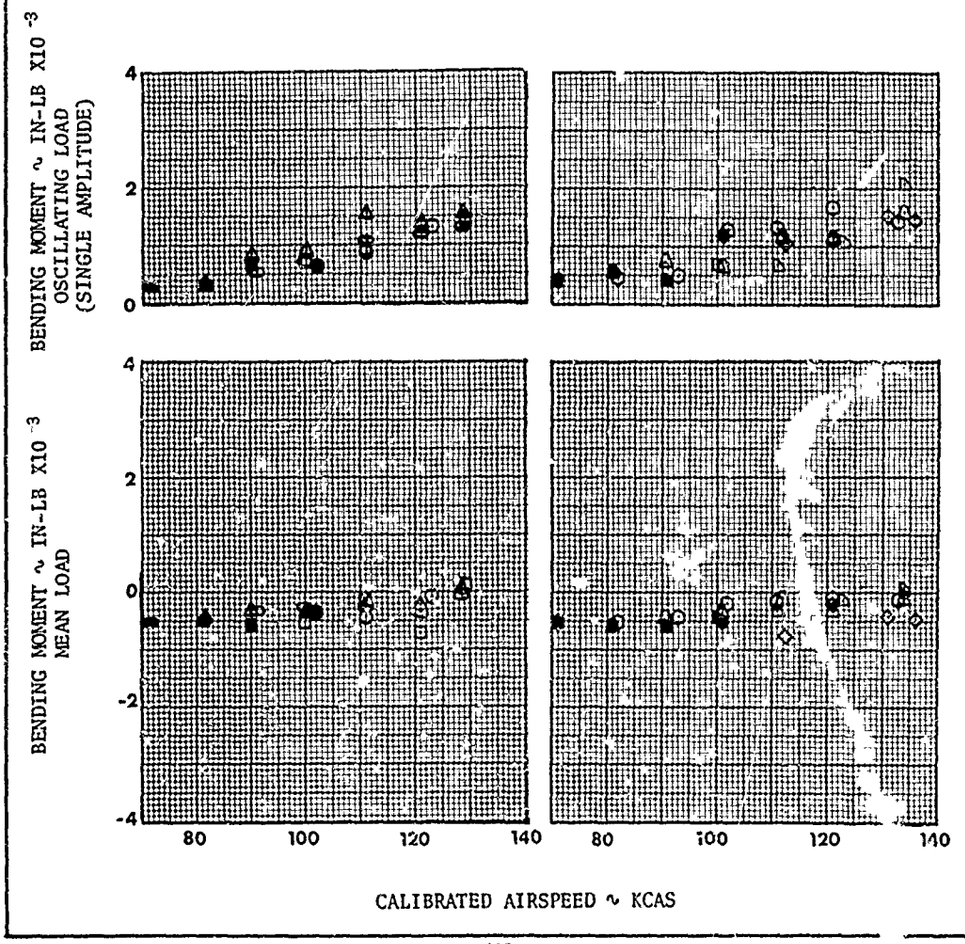


FIGURE 75
RIGHT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INST	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INST	DIVING FLT
⬡	8860	3010	128.6	0.8 RT	322	INST	DIVING FLT
◇	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
▷	7990	2300	128.4	0.3 RT	322	INST	DIVING FLT
▷	7930	3200	128.3	0.3 RT	322	INST	DIVING FLT
○	7880	3500	128.2	0.3 RT	322	INST	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

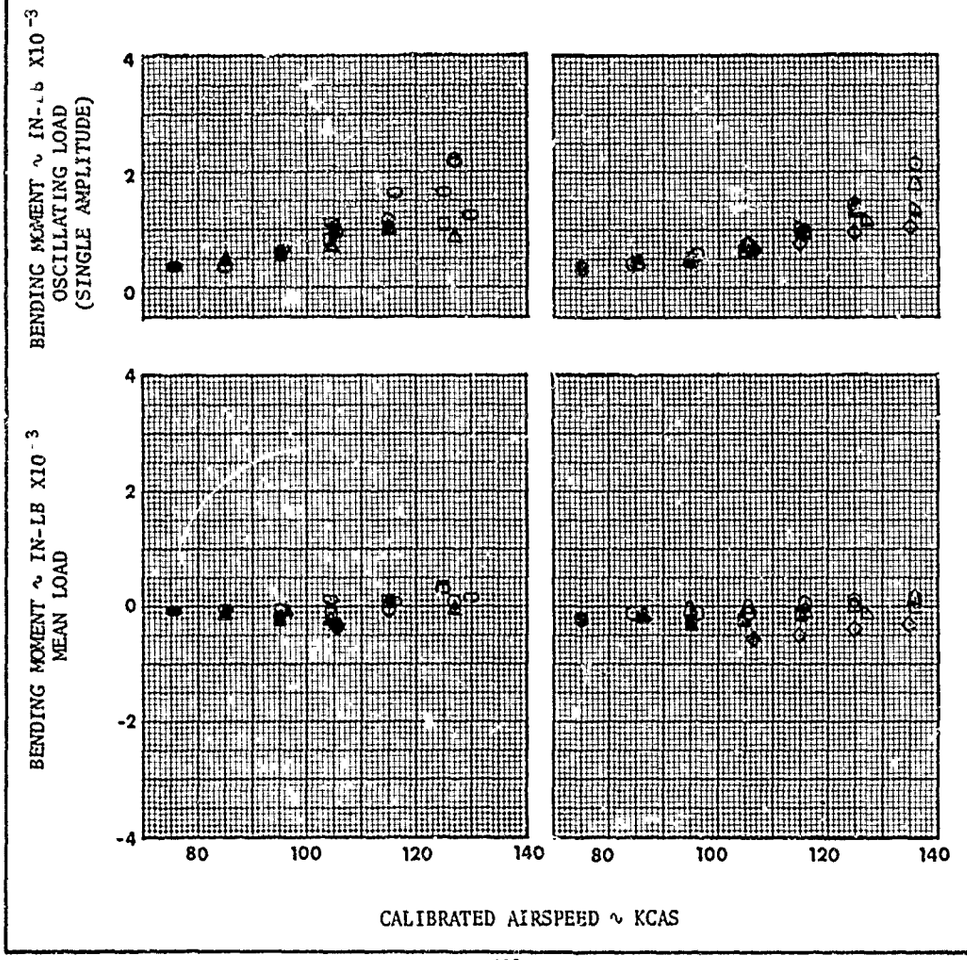


FIGURE 76
LEFT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	9500	890	129.2	0.7 RT	320	INST	HOVERING FLT
●	9250	2470	129.0	0.7 RT	322	INST	LEVEL FLT
■	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
▲	9110	5000	128.8	0.8 RT	322	INST	CLIMBING FLT
▲	9050	6500	128.8	0.8 RT	322	INST	PART PWR DESCENT
●	9030	3000	128.8	0.8 RT	318	INST	AUTOROTATION
◣	8750	1120	128.5	0.8 RT	320	INST	HOVERING FLT
◇	9520	585	129.2	0.2 RT	320	REMOVED	HOVERING FLT
○	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
□	9200	2390	129.9	0.2 RT	320	REMOVED	DIVING FLT
△	9140	5000	129.9	0.3 RT	322	REMOVED	CLIMBING FLT
△	9080	6500	129.9	0.3 RT	322	REMOVED	PART PWR DESCENT
○	9060	3000	129.8	0.3 RT	318	REMOVED	AUTOROTATION
▽	8710	810	128.5	0.3 RT	320	REMOVED	HOVERING FLT

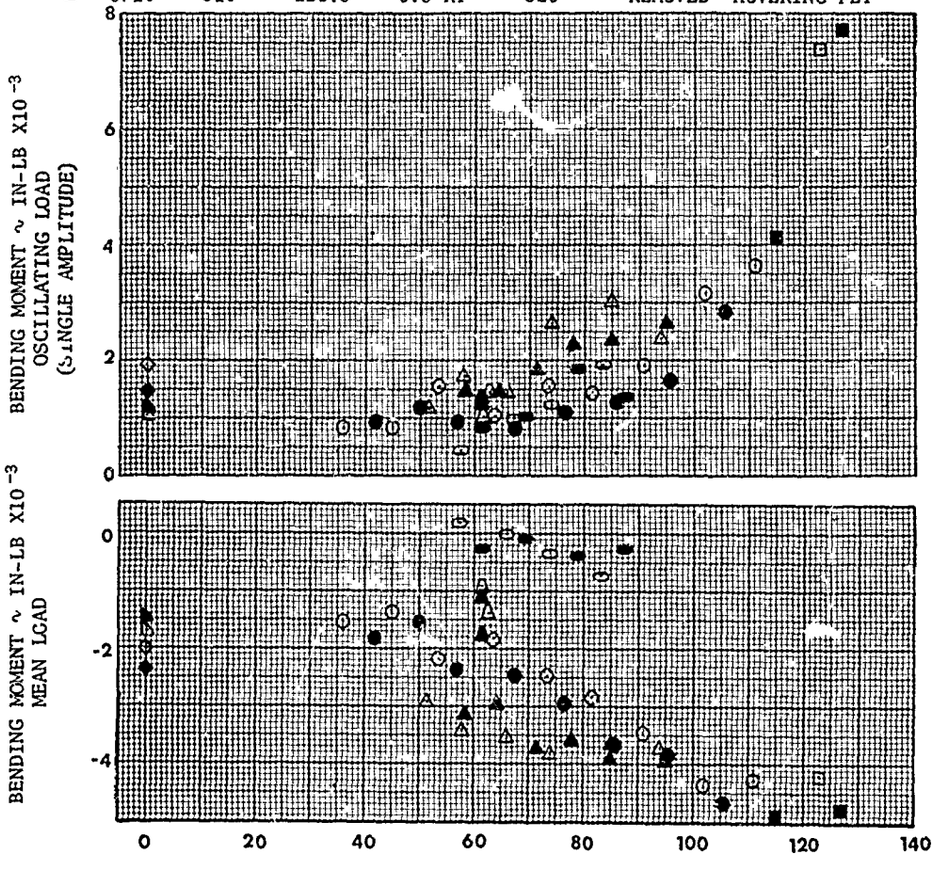


FIGURE 77

LEFT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9540	960	126.8	0.5 LT	324	INST	HOVERING FLT
○	9280	2440	126.5	0.5 LT	322	INST	LEVEL FLT
●	9210	2400	126.4	0.5 LT	318	INST	DIVING FLT
△	8910	5000	126.1	0.5 LT	322	INST	CLIMBING FLT
◬	8710	6500	125.9	0.6 LT	320	INST	PART PWR DESCENT
⊙	8680	4000	125.9	0.6 LT	320	INST	AUTOROTATION
□	8540	2480	125.7	0.6 LT	320	INST	LEVEL FLT
■	8430	2600	125.6	0.6 LT	322	INST	DIVING FLT
▷	8340	1190	125.5	0.6 LT	322	INST	HOVERING FLT

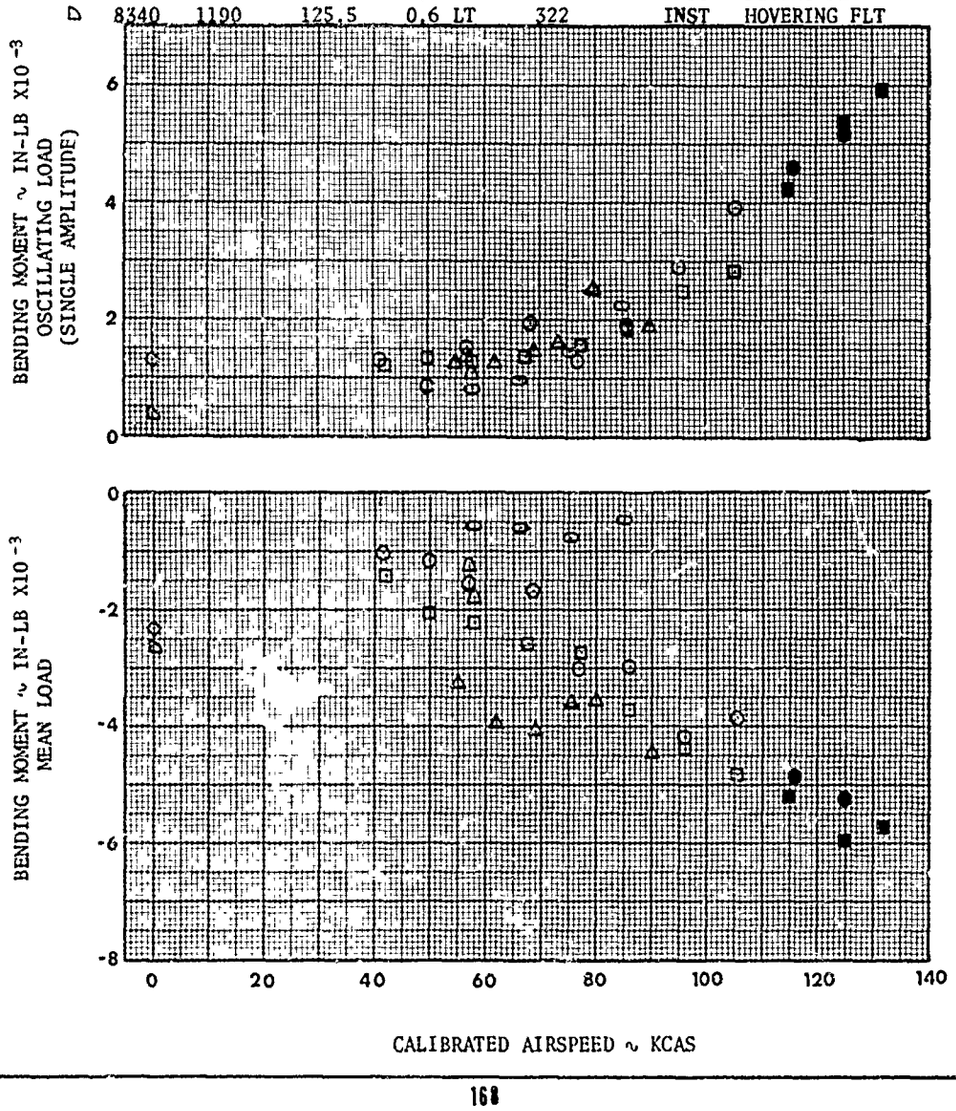


FIGURE 78
LEFT ELEVATOR BEAM BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	8320	1450	128.7	0.3 RT	320	INST	HOVERING FLT
●	8160	2340	128.5	0.3 RT	320	INST	LEVEL FLT
■	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
○	8120	2370	128.8	0.0	322	REMOVED	LEVEL FLT
□	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT

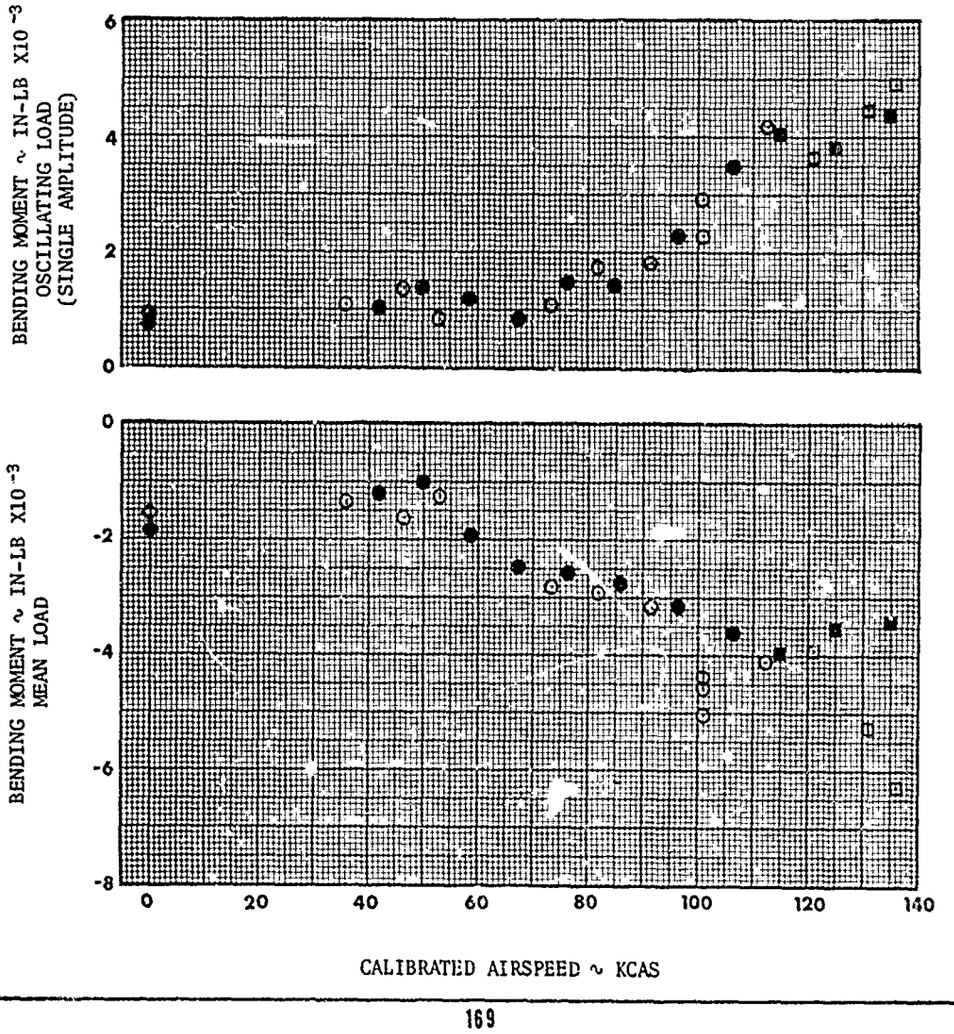


FIGURE 79
LEFT ELEVATOR BEAM BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	322	REMOVED	LEVEL FLT
□	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7590	4000	127.7	1.6 LT	322	REMOVED	CLIMBING FLT
▷	7540	6000	127.7	1.7 LT	322	REMOVED	PART PWR DESCENT
◆	7310	3500	127.4	1.7 LT	302	REMOVED	AUTOROTATION
●	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
■	7460	4990	135.7	0.5 RT	324	REMOVED	LEVEL FLT
▲	7340	5000	135.7	0.5 RT	320	REMOVED	DIVING FLT
▲	7580	5000	135.7	0.5 RT	322	REMOVED	CLIMBING FLT
●	7540	6000	135.7	0.5 RT	320	REMOVED	PART PWR DESCENT
●	7300	2500	135.7	0.5 RT	300	REMOVED	AUTOROTATION

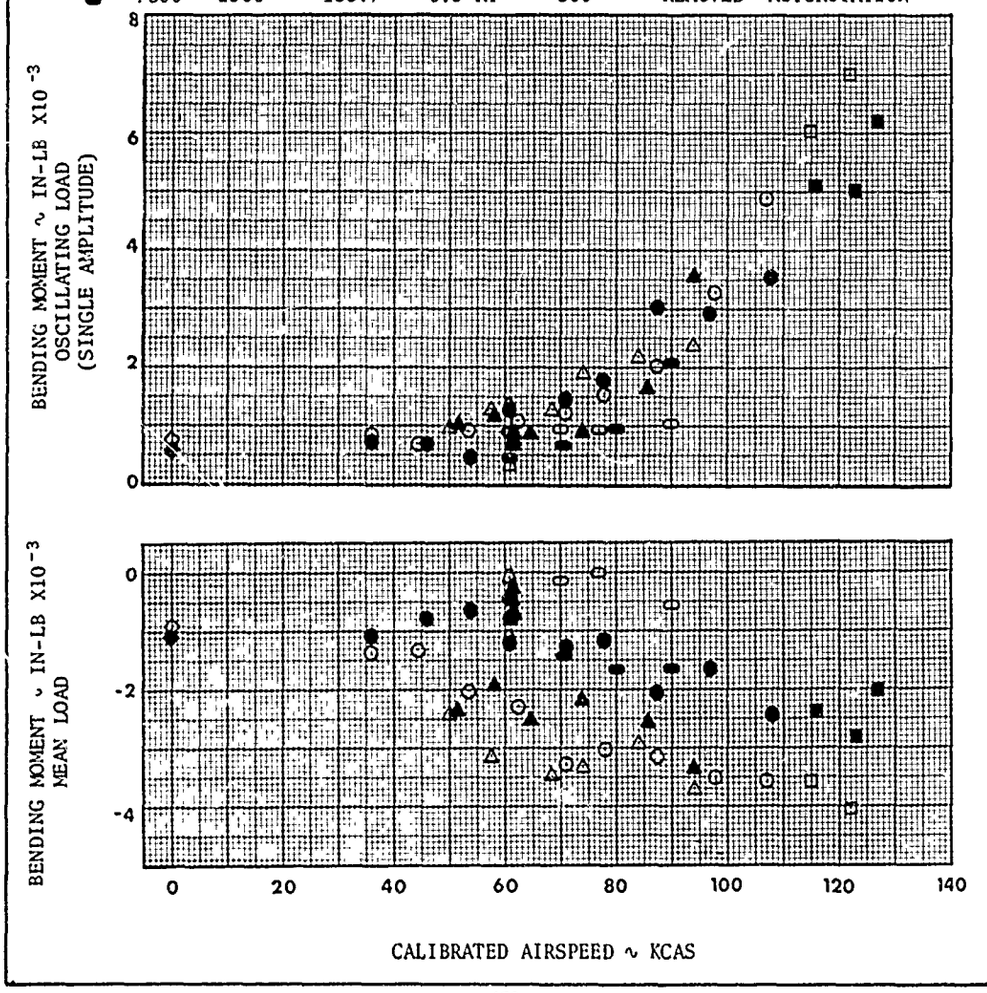


FIGURE 80
LEFT ELEVATOR BEAM BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
	8800	8120	126.1	0.6 LT	322	INST	LEVEL FLT
	8740	8000	126.0	0.6 LT	322	INST	DIVING FLT

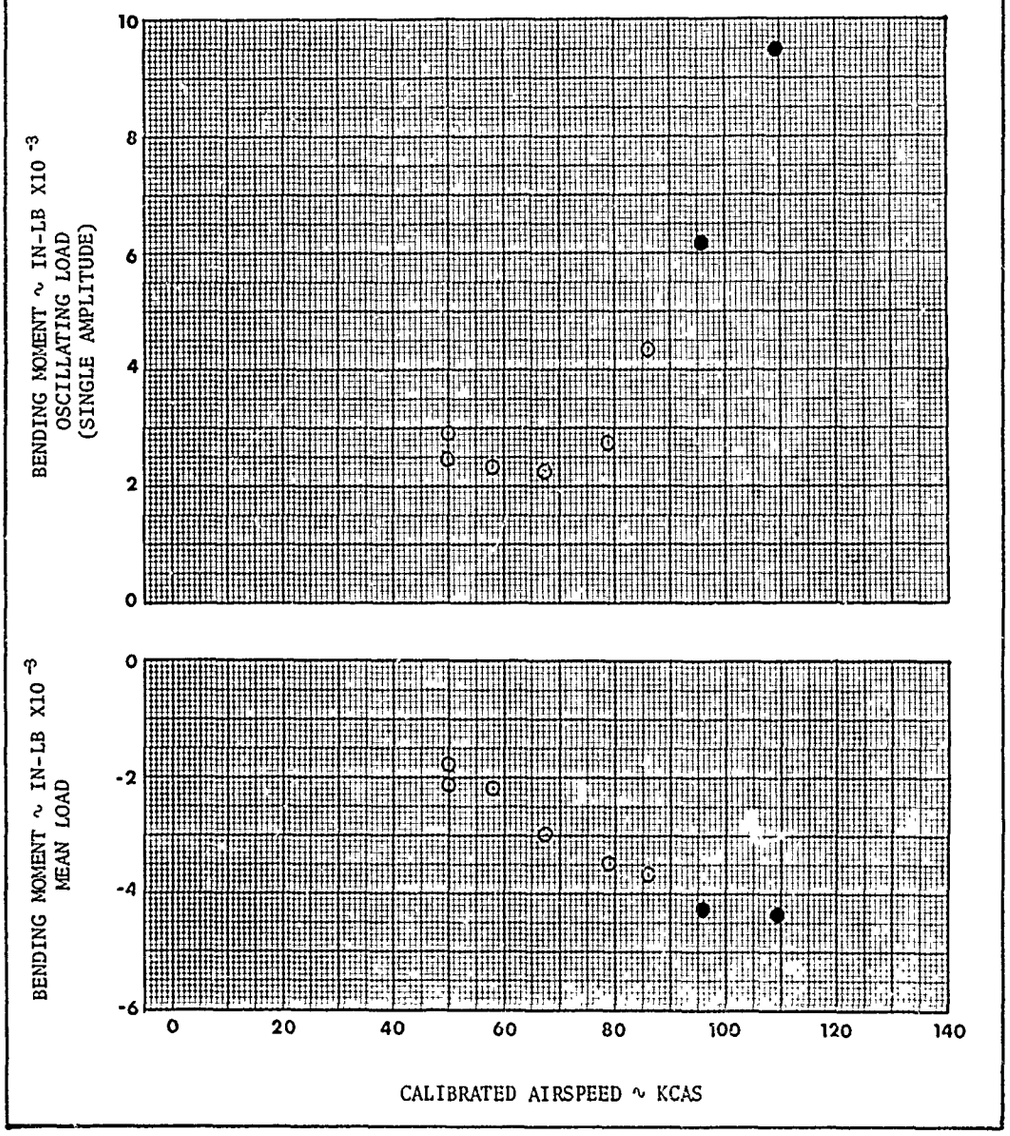


FIGURE 81
LEFT ELEVATOR BEAM BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
●□	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
△	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
◇	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
▷	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▲	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
◁	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
◇	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

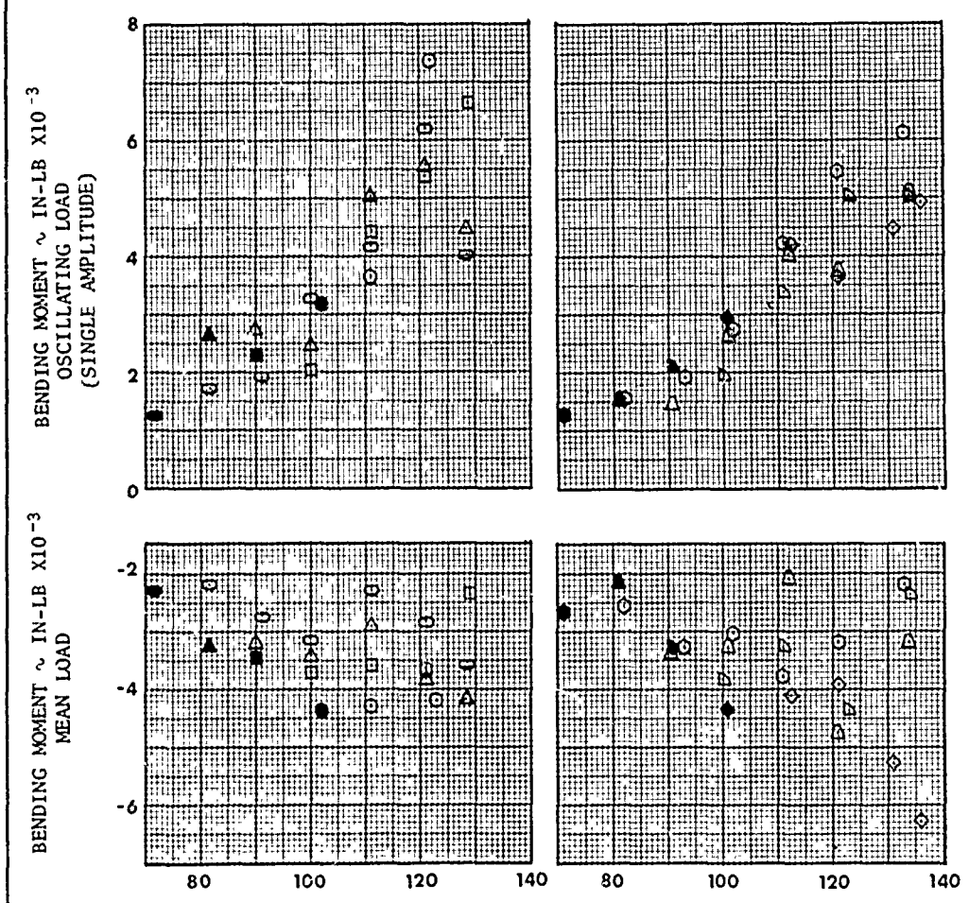


FIGURE 82
LEFT ELEVATOR BEAM BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INST	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INST	DIVING FLT
⬡	8860	3010	128.6	0.8 RT	322	INST	DIVING FLT
◇	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
▷	7990	2300	128.4	0.3 RT	322	INST	DIVING FLT
⬠	7930	3200	128.3	0.3 RT	322	INST	DIVING FLT
⬡	7880	3500	128.2	0.3 RT	322	INST	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

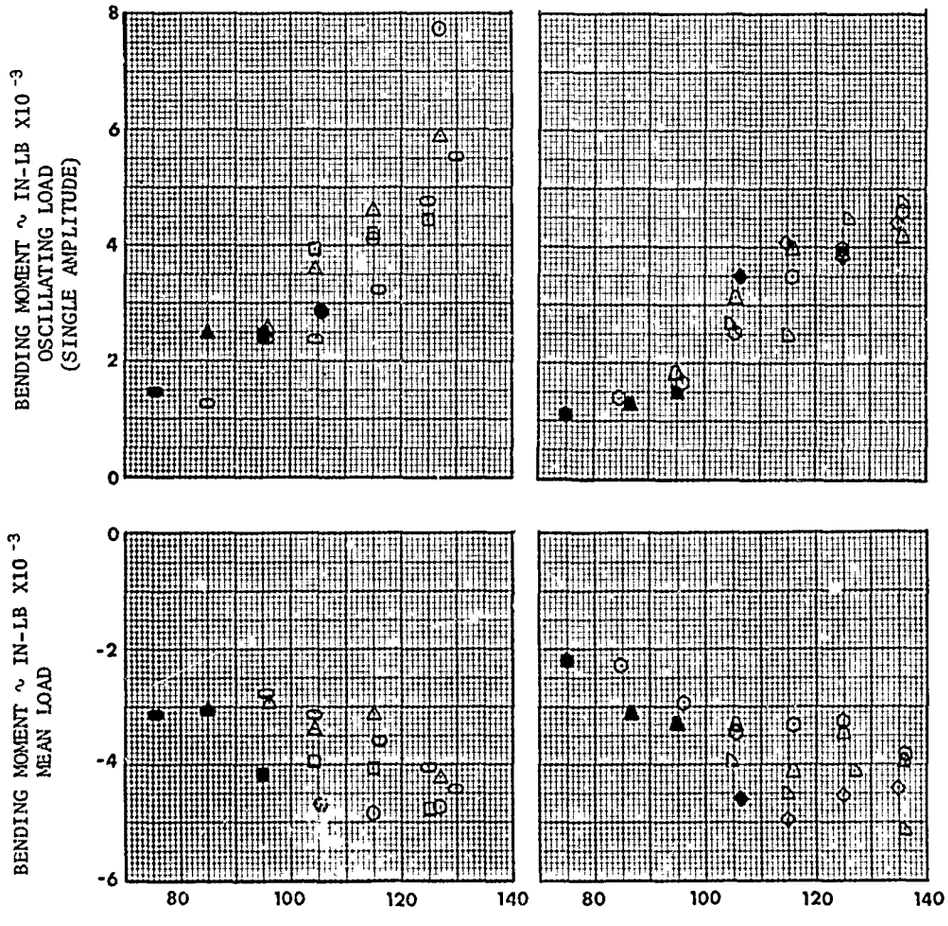


FIGURE 83
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	9500	890	129.2	0.7 RT	320	INST	HOVERING FLT
●	9250	2470	129.0	0.7 RT	322	INST	LEVEL FLT
■	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
▲	9110	5000	128.8	0.8 RT	322	INST	CLIMBING FLT
▲	9050	6500	128.8	0.8 RT	322	INST	PART PWR DESCENT
●	9030	3000	128.8	0.8 RT	318	INST	AUTOROTATION
▶	8750	1120	128.5	0.8 RT	320	INST	HOVERING FLT
◇	9520	585	129.2	0.2 RT	320	REMOVED	HOVERING FLT
○	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
□	9200	2390	129.9	0.2 RT	320	REMOVED	DIVING FLT
△	9140	5000	129.9	0.3 RT	322	REMOVED	CLIMBING FLT
△	9080	6500	129.9	0.3 RT	322	REMOVED	PART PWR DESCENT
○	9060	3000	129.8	0.3 RT	318	REMOVED	AUTOROTATION
▷	8710	810	128.5	0.3 RT	320	REMOVED	HOVERING FLT

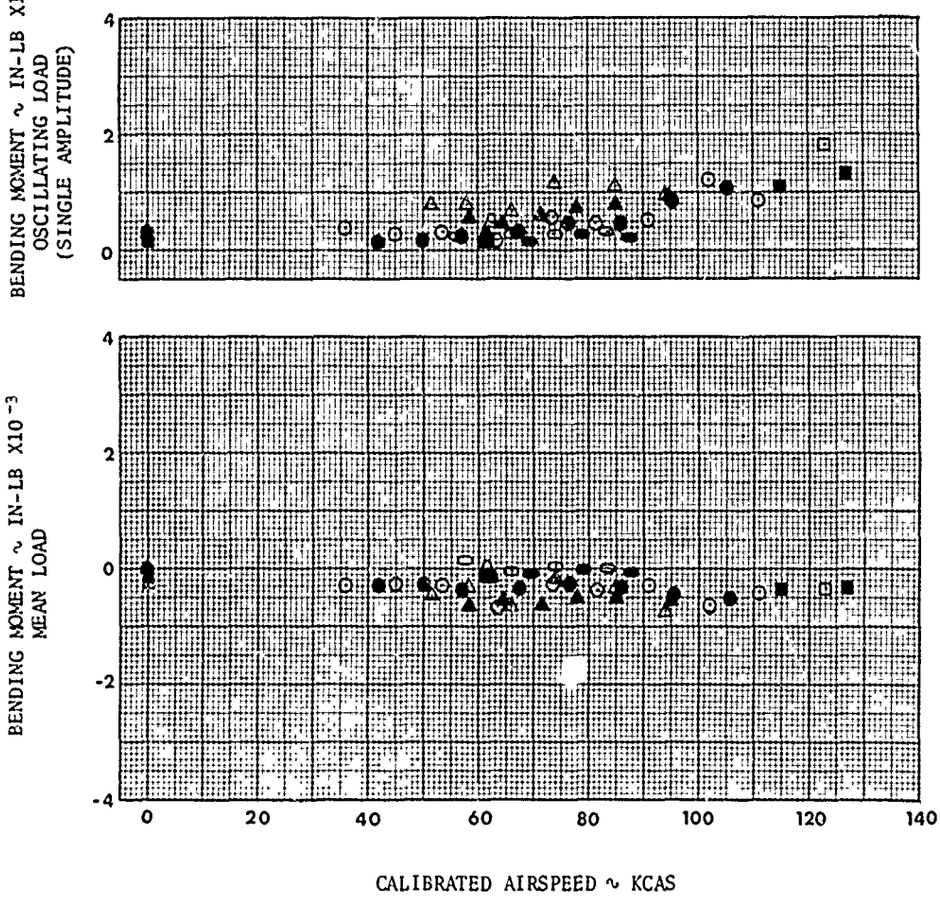


FIGURE 84
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	9540	960	126.8	0.5 LT	324	INST	HOVERING FLT
○	9280	2440	126.5	0.5 LT	322	INST	LEVEL FLT
●	9210	2400	126.4	0.5 LT	318	INST	DIVING FLT
△	8910	5000	126.1	0.5 LT	322	INST	CLIMBING FLT
△	8710	6500	125.9	0.6 LT	320	INST	PART PWR DESCENT
⊙	8680	4000	125.9	0.6 LT	320	INST	AUTOROTATION
□	8540	2480	125.7	0.6 LT	320	INST	LEVEL FLT
■	8430	2600	125.6	0.6 LT	322	INST	DIVING FLT
▷	8340	1190	125.5	0.6 LT	322	INST	HOVERING FLT

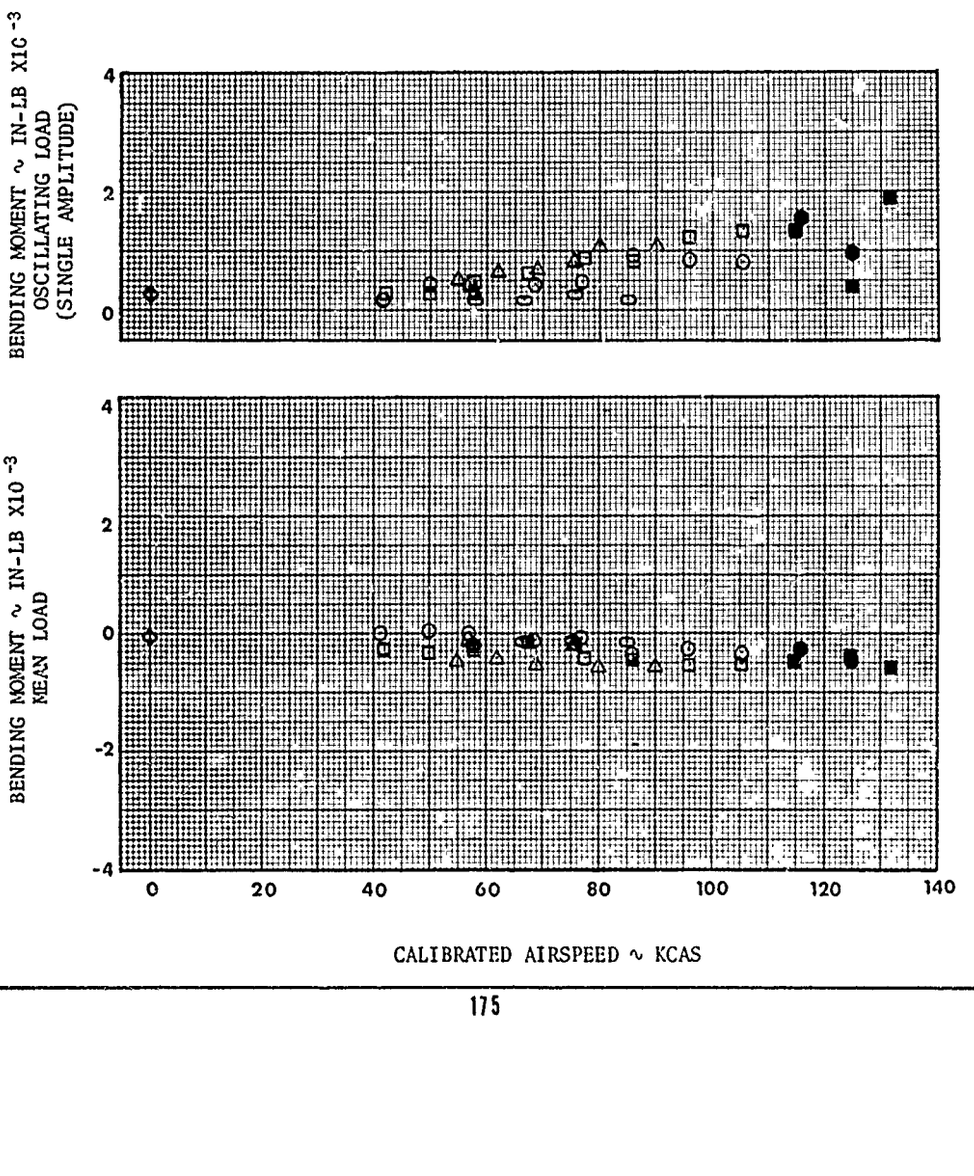


FIGURE 85
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	8320	1450	128.7	0.3 RT	320	INST	HOVERING FLT
●	8160	2340	128.5	0.3 RT	320	INST	LEVEL FLT
■	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
◇	8300	1020	129.1	0.0	324	REMOVED	HOVERING FLT
○	8[illegible]	2370	128.8	0.0	322	REMOVED	LEVEL FLT
□	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT

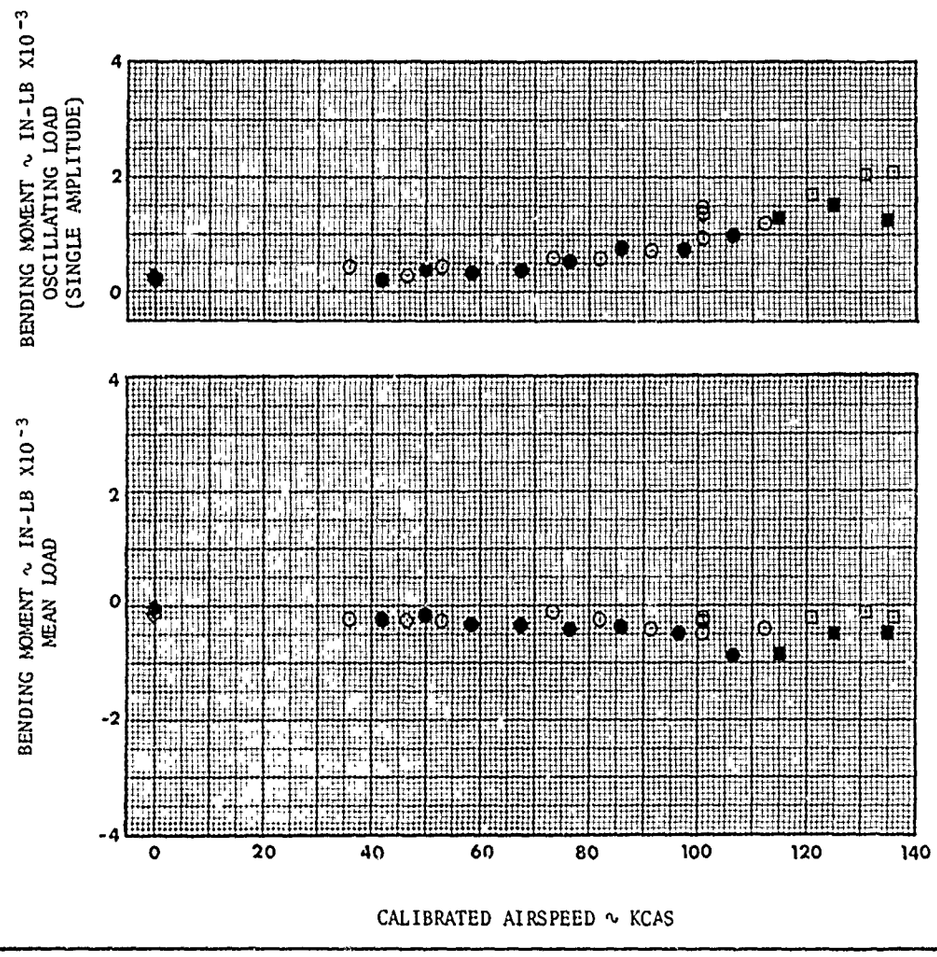


FIGURE 86
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	322	REMOVED	LEVEL FLT
□	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7590	4000	127.7	1.6 LT	322	REMOVED	CLIMBING FLT
▷	7540	6000	127.7	1.7 LT	322	REMOVED	PART PWR DESCENT
0	7310	3500	127.4	1.7 LT	302	REMOVED	AUTOROTATION
◆	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
●	7460	4990	135.7	0.5 RT	324	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	320	REMOVED	DIVING FLT
▲	7580	5000	135.7	0.5 RT	322	REMOVED	CLIMBING FLT
▲	7540	6000	135.7	0.5 RT	320	REMOVED	PART PWR DESCENT
●	7300	2500	135.7	0.5 RT	300	REMOVED	AUTOROTATION

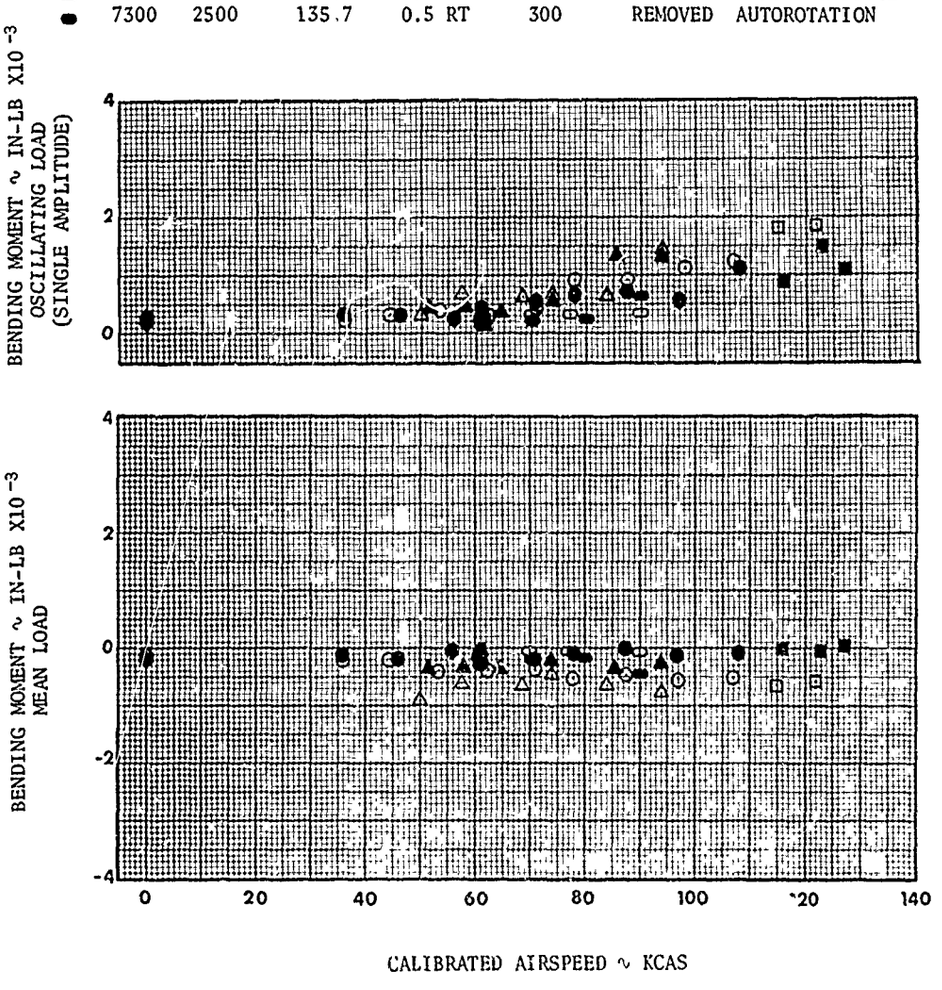


FIGURE 87
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	8800	8120	126.1	0.6 LT	322	INST	LEVEL FLT
●	8740	8000	126.0	0.6 LT	322	INST	DIVING FLT

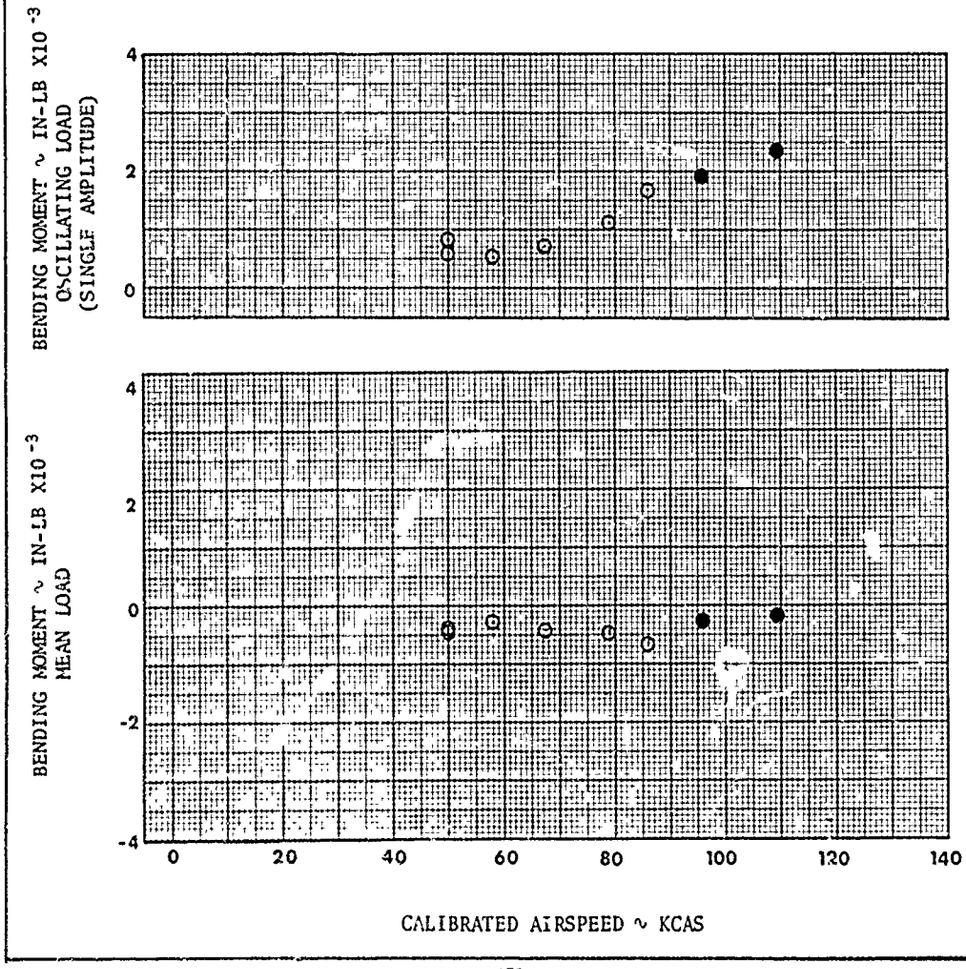


FIGURE 88
LEFT ELEVATOR CHORD BENDING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
□	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
△	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
⊙	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
◇	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▷	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
△	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
⬡	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

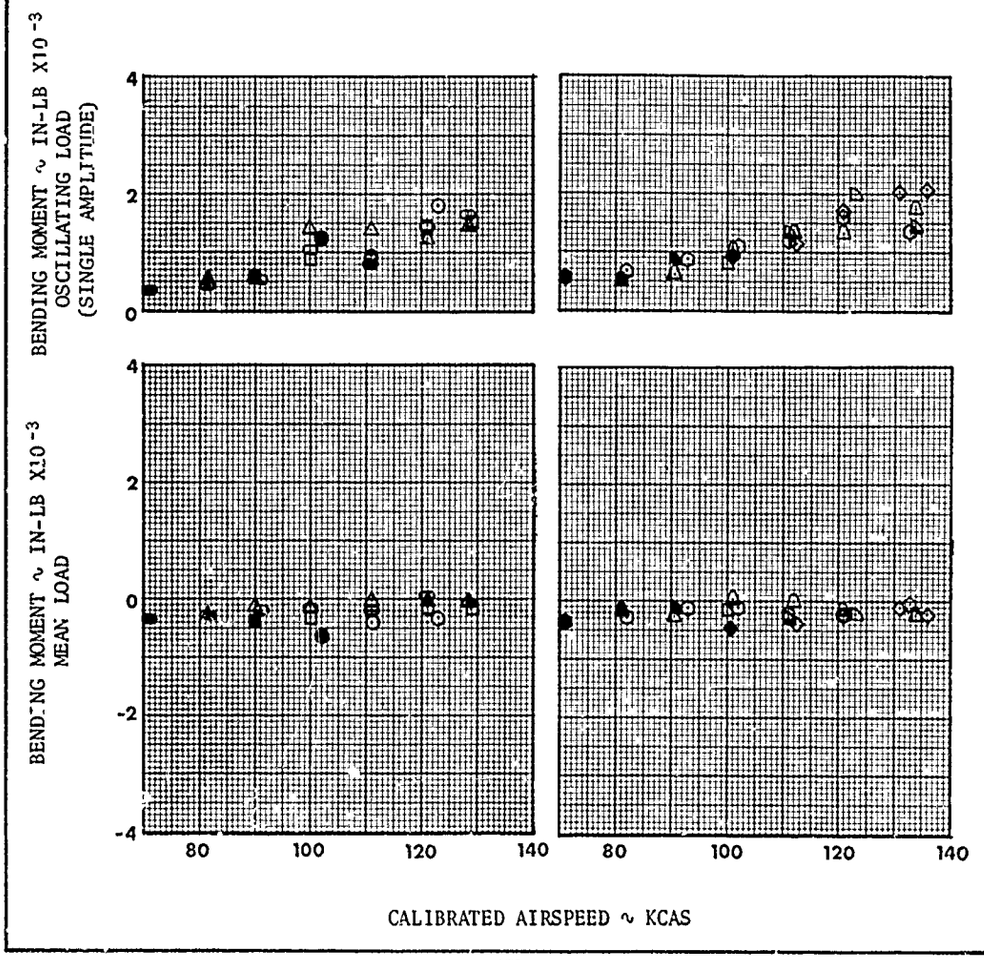


FIGURE 89

LEFT ELEVATOR CHORD BENDING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INST	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INST	DIVING FLT
⬡	8860	3010	128.6	0.8 RT	322	INST	DIVING FLT
◇	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
▷	7990	2300	128.4	0.3 RT	322	INST	DIVING FLT
⬠	7930	3200	128.3	0.3 RT	322	INST	DIVING FLT
○	7880	3500	128.2	0.3 RT	322	INST	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

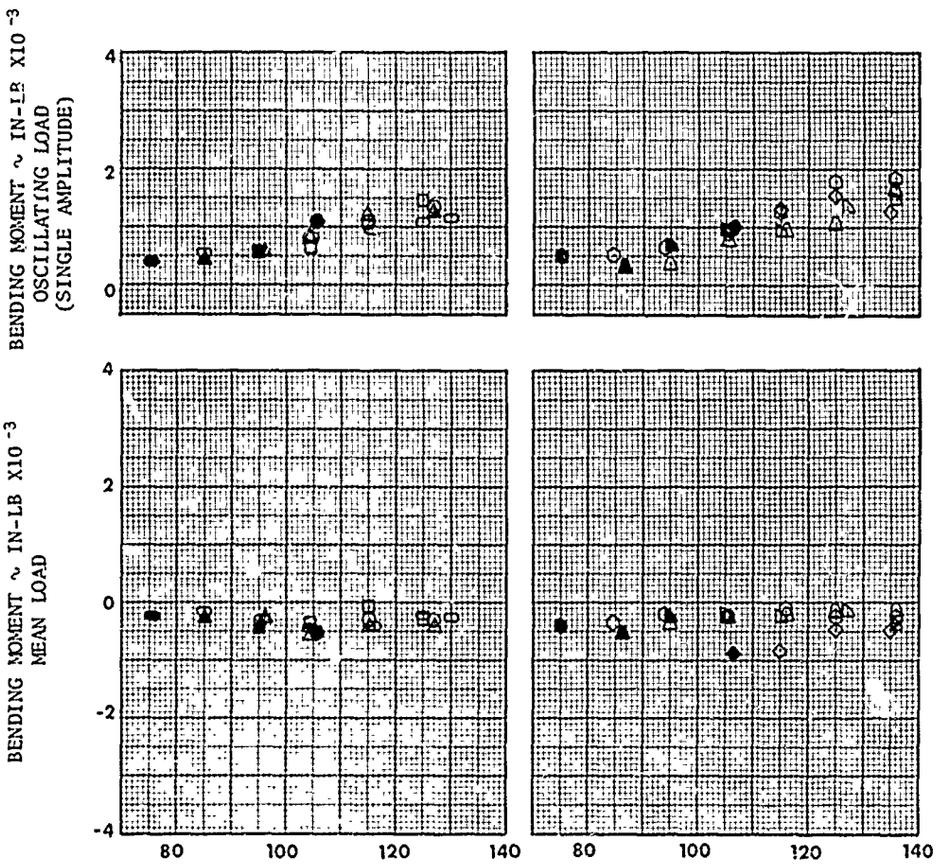


FIGURE 90
LEFT ELEVATOR TORQUING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT CONDITION
◆	9500	890	129.2	0.7 RT	320	INST	HOVERING FLT
●	9250	2470	129.0	0.7 RT	322	INST	LEVEL FLT
■	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
▲	9110	5000	128.8	0.8 RT	322	INST	CLIMBING FLT
▲	9050	6500	128.8	0.8 RT	322	INST	PART PWR DESCENT
●	9030	3000	128.8	0.8 RT	318	INST	AUTOROTATION
◗	8750	1120	128.5	0.8 RT	320	INST	HOVERING FLT
◇	9520	585	129.2	0.2 RT	320	REMOVED	HOVERING FLT
○	9320	2390	129.0	0.2 RT	322	REMOVED	LEVEL FLT
□	9200	2390	129.9	0.2 RT	320	REMOVED	DIVING FLT
△	9140	5000	129.9	0.3 RT	322	REMOVED	CLIMBING FLT
▷	9080	6500	129.9	0.3 RT	322	REMOVED	PART PWR DESCENT
○	9060	3000	129.8	0.3 RT	318	REMOVED	AUTOROTATION
▷	8710	810	128.5	0.3 RT	320	REMOVED	HOVERING FLT

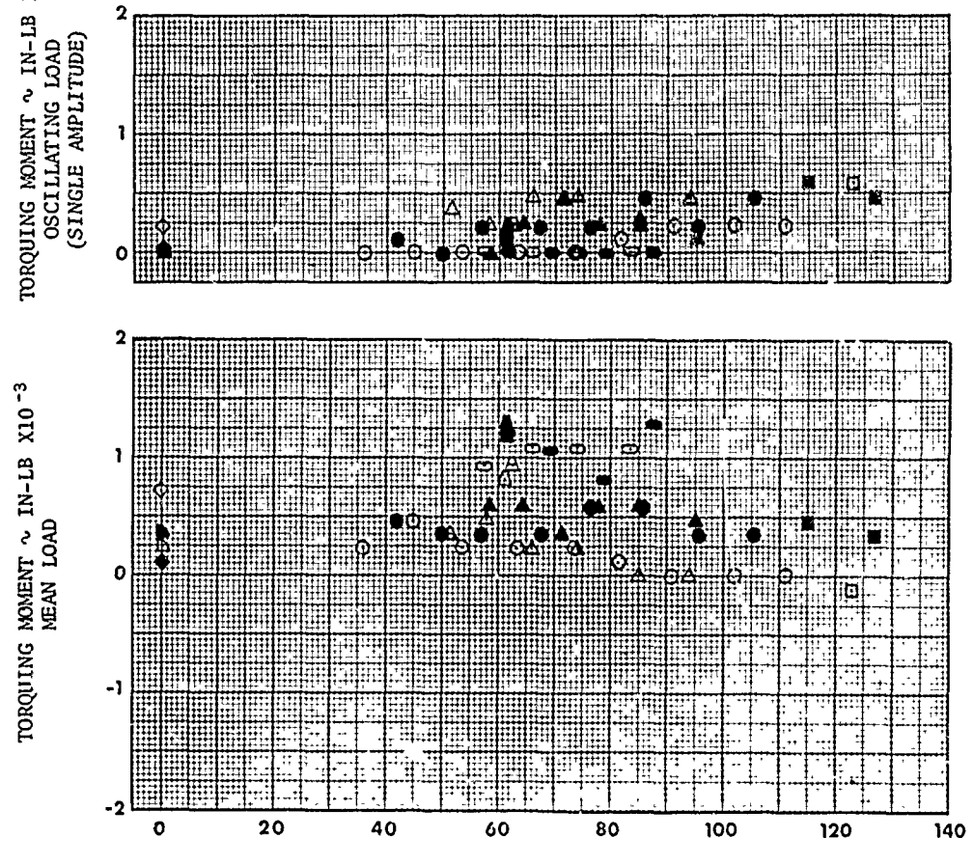


FIGURE 91
LEFT ELEVATOR TORQUING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◆	8320	1450	128.7	0.3 RT	320	INST	HOVERING FLT
●	8160	2340	128.[illegible]	0.3 RT	320	INST	LEVEL FLT
■	8060	2000	128.[illegible]	0.3 RT	320	INST	DIVING FLT
◇	8300	1020	129.[illegible]	0.0	324	REMOVED	HOVERING FLT
○	8120	2370	128.8	0.0	322	REMOVED	LEVEL FLT
□	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT

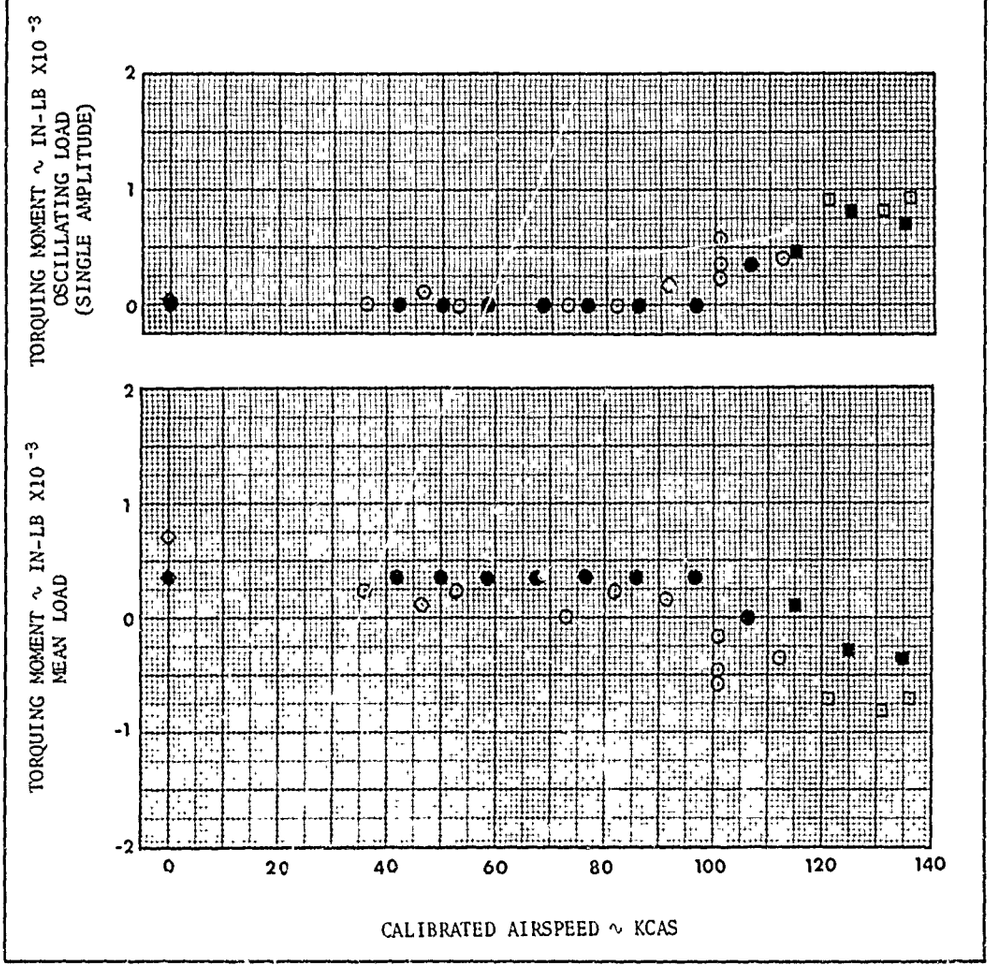


FIGURE 92

LEFT ELEVATOR TORQUING MOMENT

UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
◇	7640	660	127.8	1.6 LT	322	REMOVED	HOVERING FLT
○	7440	5060	127.5	1.6 LT	322	REMOVED	LEVEL FLT
□	7350	5000	127.4	1.7 LT	320	REMOVED	DIVING FLT
△	7590	4000	127.7	1.6 LT	322	REMOVED	CLIMBING FLT
▱	7540	6000	127.7	1.7 LT	322	REMOVED	PART PWR DESCENT
⬭	7310	3500	127.4	1.7 LT	302	REMOVED	AUTOROTATION
◆	7650	890	135.7	0.5 RT	316	REMOVED	HOVERING FLT
●	7460	4990	135.7	0.5 RT	324	REMOVED	LEVEL FLT
■	7340	5000	135.7	0.5 RT	320	REMOVED	DIVING FLT
▲	7580	5000	135.7	0.5 RT	322	REMOVED	CLIMBING FLT
▰	7540	6000	135.7	0.5 RT	320	REMOVED	PART PWR DESCENT
⬬	7300	2500	135.7	0.5 RT	300	REMOVED	AUTOROTATION

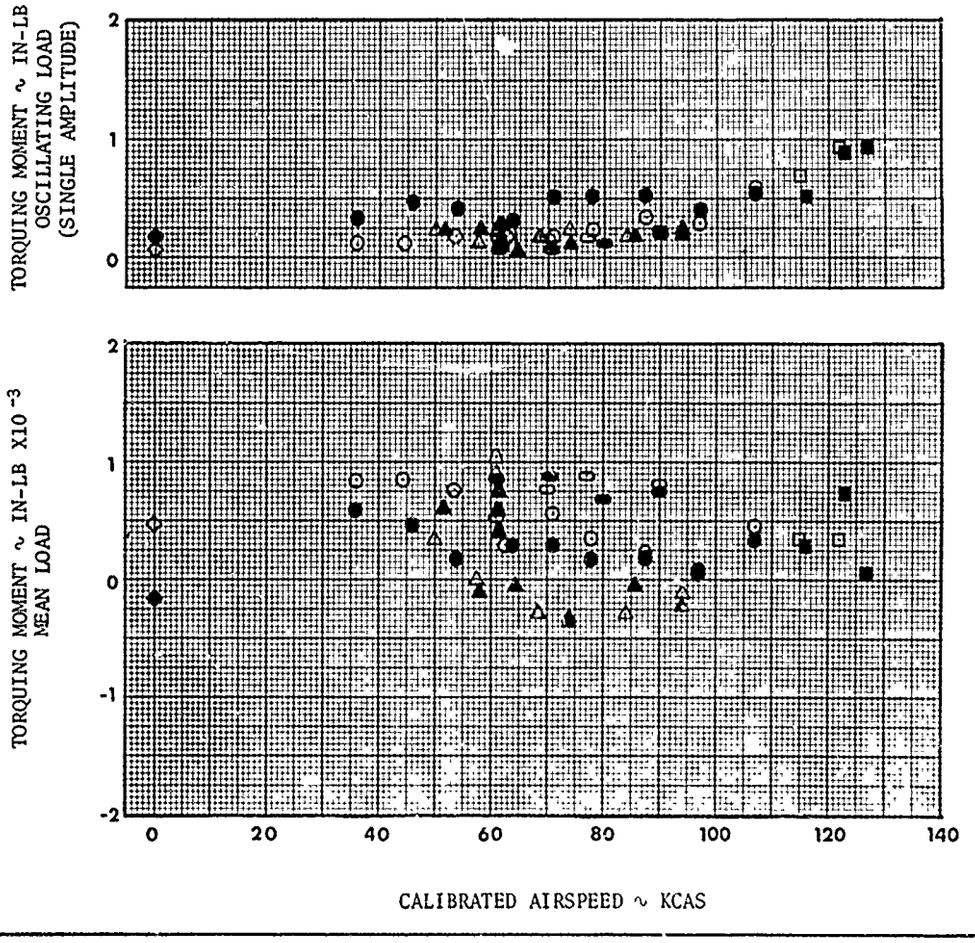


FIGURE 93
LEFT ELEVATOR TORQUING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9200	2390	129.9	0.0	320	REMOVED	DIVING FLT
□	9030	2800	128.8	0.0	322	REMOVED	DIVING FLT
△	8860	2800	128.7	0.0	322	REMOVED	DIVING FLT
◇	8800	3500	128.6	0.0	322	REMOVED	DIVING FLT
▷	8030	2400	128.8	0.0	320	REMOVED	DIVING FLT
▷	7920	2760	128.7	0.0	320	REMOVED	DIVING FLT
○	7800	3200	128.7	0.0	322	REMOVED	DIVING FLT
○	7850	3200	128.7	0.0	320	REMOVED	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.

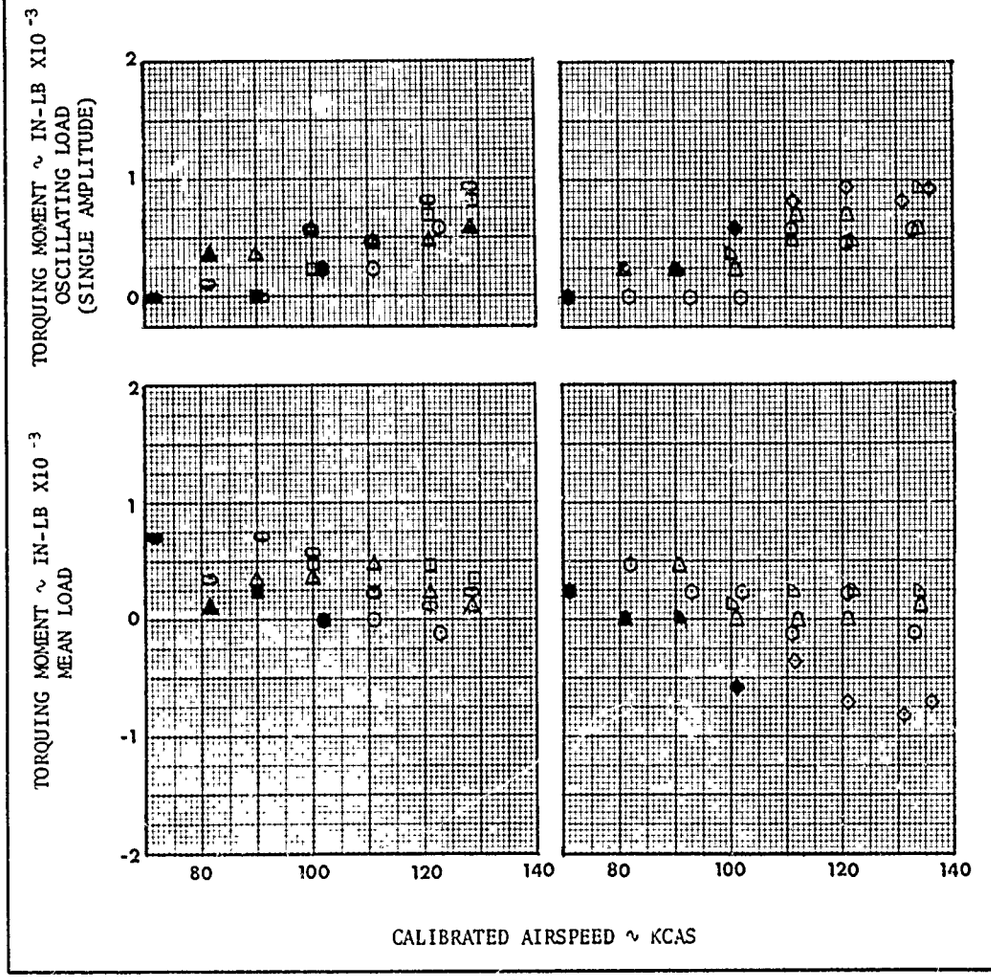
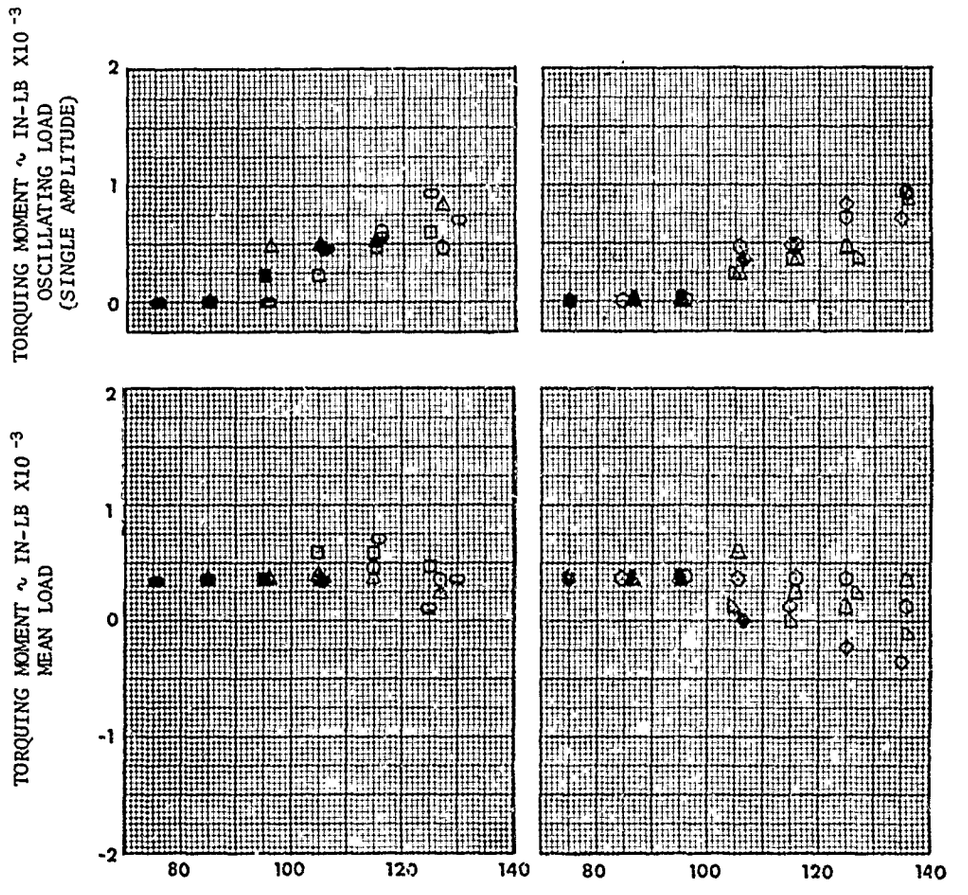


FIGURE 94
LEFT ELEVATOR TORQUING MOMENT
UH-1M USA S/N 66 0672

SYM	AVG GRWT LB	AVG DEN ALT FT	AVG LONG CG IN	AVG LAT CG IN	AVG ROTOR SPEED RPM	FLIR SENSOR CONFIG	FLIGHT COND
○	9160	2470	128.9	0.8 RT	322	INST	DIVING FLT
□	8980	2800	128.7	0.8 RT	322	INST	DIVING FLT
△	8930	2550	128.7	0.8 RT	322	INST	DIVING FLT
⬯	8860	3010	128.6	0.8 RT	322	INST	DIVING FLT
◇	8060	2000	128.5	0.3 RT	320	INST	DIVING FLT
▷	7990	2300	128.4	0.3 RT	322	INST	DIVING FLT
⬠	7930	3200	128.3	0.3 RT	322	INST	DIVING FLT
⬡	7880	3500	128.2	0.3 RT	322	INST	DIVING FLT

NOTE: SHADED POINTS DENOTE TRIM LEVEL FLIGHT CONDITION.



APPENDIX V. SYMBOLS AND ABBREVIATIONS

Abbreviation	Definition	Unit
ALT	Altitude	foot
AVG	Average	–
BL	Butt line	inch
CG, cg	Center of gravity	–
COND	Condition	–
FLT	Flight	–
ft	Foot, feet	foot
FS	Fuselage station	inch
FWD, fwd	Forward	–
G, g	Acceleration	ft/sec^2
GRWT, grwt	Gross weight	pound
Hz	Cycles per second	Hertz
in.	Inch, inches	inch
KCAS	Knots calibrated airspeed	knot
LB, lb	Pound, pounds	pound
LAT	Lateral (right/left)	–
L	Left	–
LONG.	Longitudinal (fore/aft)	–
MAX, max	Maximum	–
MIN, min	Minimum	–
ref	Reference	–

Abbreviation	Definition	Unit
R/D	Rate of descent	ft/min
R	Right	–
SEC, sec	Second	–
SL	Sea level	–
S/N	Serial number	–
STD, std	Standard	–
SYM	Symbol	–
VERT	Vertical (up/down)	–
WL	Water line	inch
2, 4, 6, 8, or 10/rev	Vibration harmonic per main rotor revolution	–

Symbol	Definition	Unit
H_D	Density altitude	foot
H_P	Pressure altitude	foot
M_θ	Torquing moment	in.-lb
M_b	Beam bending moment	in.-lb
M_c	Chord bending moment	in.-lb
V_{cal}	Calibrated airspeed	knot
V_H	Maximum airspeed for level flight	knot
V_L	Limit airspeed	knot